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TRANSACTIONS

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OF LONDON.

VOLUME XVIII.

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TRANSACTIONS

OF

THE ZOOLOGICAL SOCIETY OF LONDON.

I. *On New or Rare Crustacea of the Order Cumacea from the Collection of the Copenhagen Museum.*—Part I. *The Families* Bodotriidæ, Vauntompsoniidæ, *and* Leuconidæ. *By* W. T. CALMAN, *D.Sc., F.Z.S., British Museum (Natural History).*

(Received December 5, 1906; read February 5, 1907.)

[PLATES I.–IX.]

THIS paper deals with a part of a rich collection of Cumacea belonging to the Zoological Museum of Copenhagen, and entrusted to me for examination by the kindness of Dr. F. Meinert and Dr. H. J. Hansen. It also includes a description of some specimens sent to me from New Zealand by Mr. G. M. Thomson, which throw light on species represented in the Copenhagen Collection.

Altogether 30 species are dealt with, and of these 25 are regarded as new. The majority of the species are derived from collections made in New Zealand and the Gulf of Siam by Mr. H. Suter and Dr. Th. Mortensen respectively. There is no ground for supposing that these localities are unusually prolific in Cumacea, and the rich collections obtained there simply help to indicate how much remains to be done by competent collectors in investigating the micro-crustacean fauna of shallow water in tropical and southern seas.

Among the more interesting of the forms described below attention may be called to the remarkable new species for which I have established the genus *Zygosiphon*; to the very aberrant forms of Leuconidæ comprised in the new genera *Heteroleucon*, *Paraleucon*, and *Hemileucon*, and to the long series of new species referred to the genus *Cyclaspis*. The re-discovery of Sars's *Leptocuma kingbergii* is also of interest, but the solitary specimen, though of relatively gigantic size, has not enabled me to add much to our knowledge of the species.

By the courtesy of the authorities of the Copenhagen Museum, a selection of the specimens here described has been retained for the British Museum.

List of the Species dealt with in this Paper.

Family Bodotriidæ.	
Bodotria sublevis, sp. n.	Gulf of Siam.
,, *similis*, sp. n.	,,
,, *siamensis*, sp. n.	,,
,, *parva*, sp. n.	,,
Cyclaspis longipes, sp. n.	West Indies.
,, *levis* G. M. Thomson.	New Zealand.
,, *elegans*, sp. n.	,,
,, *similis*, sp. n.	,,
,, *uniplicata*, sp. n.	Gulf of Siam.
,, *unicornis*, sp. n.	West Indies.
,, *cingulata*, sp. n.	Gulf of Siam.
,, *thomsoni*, sp. n.	New Zealand.
,, *biplicata*, sp. n.	,,
,, *triplicata*, sp. n.	,,
Eocuma longicornis, sp. n.	Suez.
,, *lata*, sp. n.	Gulf of Siam.
,, *stellifera*, sp. n.	,,
,, *producta*, sp. n.	Penang.
Zygosiphon mortenseni, gen. et sp. n.	Gulf of Siam.
Iphinoë sp.	,,
Family Vauntompsoniidæ.	
Vauntompsonia cristata Spence Bate.	West Indies.
,, *arabica*, sp. n.	Suez Canal, Aden.
Leptocuma kinbergii G. O. Sars.	Straits of Magellan.
Family Leuconidæ.	
Leucon (?) *heterostylis*, sp. n.	New Zealand.
Eudorella truncatula (Spence Bate).	,,
Eudorellopsis resimus, sp. n.	,,
Heteroleucon akaroënsis, gen. et sp. n.	,,
Paraleucon suteri, gen. et sp. n.	,,
Hemileucon uniplicatus, gen. et sp. n.	,,
,, *comes*, sp. n.	,,

Family BODOTRIIDÆ.

Genus Bodotria.

As I have elsewhere pointed out (Cumacea of Siboga Exped. p. 5), this genus is distinguished from *Cyclaspis* by very slight characters, of which the chief is the possession of a longitudinal lateral ridge on the carapace, and even this becomes inconspicuous in some of the new species described below.

Key to the Species of Bodotria.

A. Endopod of uropods composed of two segments.
- a. A single lateral ridge on carapace.
  - *a.* Lateral ridge well-marked, extending on to free thoracic somites.
    - *a′*. Thoracic somites keeled dorsally . . . . *B. scorpioides* (Mont.).
    - *b′*. Thoracic somites produced dorsally into laminar crests . . . *B. gibba* (Sars).
  - *b.* Lateral ridge faintly marked on carapace, not developed on thoracic somites . . . . *B. sublevis*, sp. n.
- b. Two distinct lateral ridges on carapace . . . . *B. pulchella* (Sars).

B. Endopod of uropods unsegmented.
- a. Lateral ridge well-marked, extending on to thoracic somites.
  - *a.* Basis of first leg (in female) $1\frac{1}{2}$ times as long as distal segments. *B. arenosa* Goodsir.
  - *b.* Basis of first leg (in female) shorter than distal segments . . . *B. similis*, sp. n.
- b. Lateral ridge faintly marked on carapace, not developed on thoracic somites.
  - *a.* Antennal tooth of carapace acute . . . . *B. siamensis*, sp. n.
  - *b.* Antennal tooth of carapace rounded . . . . *B. parva*, sp. n.

B. pulex Zimmer has been omitted from the key as I have seen no specimens. It has the endopod of the uropods unsegmented, and the lateral ridge faintly marked on the carapace but well-developed on the free thoracic somites.

In the collection of the Rev. Canon Norman I have examined four specimens labelled "*Cuma folinii* Fischer" from the Bay of Biscay. I have been unable to discover whether any description of this species has been published. It is closely allied to *B. arenosa*, of which, perhaps, it may be only a variety.

Bodotria sublevis, sp. n. (Plate I. figs. 1–3.)

Description of adult Female.—Total length 2·6 mm.

The carapace is a little more than two-sevenths of the total length. The dorsal edge, seen from the side, is nearly straight, with a slight notch at about one-third of the length from the hind margin. The pseudorostrum is nearly horizontal. The dorsal keel is distinct but not prominent on the carapace and thoracic somites. On the carapace the lateral keel is distinct only in its middle portion, and its posterior end curves slightly upwards; it is not developed on the first free somite, and only a slight lateral elevation indicates its place on the posterior thoracic somites; below it on the carapace is a slightly marked elevation, not forming a distinct keel, and behind the above-mentioned notch on the dorsal surface is a slight transverse elevation, not sharply defined. Antennal tooth triangular. Basis of first legs a little shorter than the remaining segments together. Uropods longer than the last two somites together, the rami two-thirds as long as the peduncle. Endopod of two segments, the proximal nearly four times as long as the distal, with five spines on its inner edge; distal segment with two spines.

Immature Male.—Total length 2·6 mm.

Resembling the female, except that the carapace is still smoother, the lateral keel being the only one distinct.

Occurrence.—Gulf of Siam, "Koh Kam, 5 fathoms, 6/2/00." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

Bodotria similis, sp. n. (Plate I. figs. 4–9.)

Description of adult Female.—Total length 2·15 mm.

Closely resembling in general characters *B. arenosa* Goodsir. Carapace less than two-sevenths of total length. Median dorsal keel rather prominent on the thoracic somites. Lateral keel well-marked and straight on carapace and on all except the last of the free thoracic somites. No distinct ridge below lateral keel on side of carapace. Antennal tooth triangular. Basis of first legs a little shorter than the remaining segments together. Uropods longer than the last two somites together, the exopod about three-fourths as long as the peduncle and a little longer than the endopod. Endopod unsegmented, with six small spines on the distal part of its inner edge, the last close to the slender terminal spine. Exopod with two unequal slender terminal spines and a series of setæ on the inner edge.

Adult Male.—Total length 2·8 mm.

There is a distinct ridge on the side of the carapace below the lateral keel. The latter is distinct on all the free thoracic somites. Basis of first legs a little longer than the remaining segments together. Rami of uropods subequal and two-thirds as long as the peduncle. Endopod with twelve spines on the inner edge.

Remarks.—This species resembles very closely the *B. arenosa* of British and Norwegian Seas. It is distinguished by its very much smaller size, by the shorter basis of the first legs, and by the longer rami of the uropods.

Occurrence.—Gulf of Siam, "Between Koh Mesan and Cape Liant" and "Tung Kaben." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

BODOTRIA SIAMENSIS, sp. n. (Plate I. figs. 10–15.)

Description of adult Female.—Total length 2·1 mm.

Carapace about one-fourth of total length. Median dorsal keel not very prominent on carapace or on thoracic somites. Lateral keel rather faintly marked on anterior part of carapace, becoming obsolete posteriorly; not continued on to the thoracic somites. Antennal tooth narrow and acute, almost spiniform. Basis of first legs about four-fifths as long as the remaining segments together. Uropods about one-fifth longer than the last two somites together, the rami sub-equal and five-sixths as long as the peduncle. Endopod unsegmented, with nine spines on distal part of its inner edge, increasing in size distally; terminal spine slender. Exopod with three unequal terminal spines and a series of setæ on the inner edge.

A transverse band of dark pigment occupies the region of the first leg-bearing somite.

Adult Male.—Total length 2·75 mm.

Carapace less than one-fourth of total length. Rami of uropods about three-fourths as long as the peduncle. Endopod with ten spines along the whole length of its inner edge, increasing in size distally.

Remarks.—This species resembles in many ways *B. similis*, in company with which it was found; but it is distinguished from that species by the lateral keel being inconspicuous on the carapace, and absent altogether from the thoracic somites.

Occurrence.—Gulf of Siam, "Between Koh Mesan and Cape Liant, 5–8 fathoms"; "Koh Kam, 5–10 fathoms." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

BODOTRIA PARVA, sp. n. (Plate I. figs. 16–18.)

Description of adult Female.—Total length 1·5 mm.

Carapace more than two-sevenths of total length. Dorsal edge with a depression bounded behind by a slight crescentic transverse ridge near its hinder end. Two faintly marked longitudinal ridges on sides of carapace, not reaching to posterior margin nor joining the above-mentioned transverse ridge. Antennal tooth bluntly rounded. No ridges on the free thoracic somites. Basis of first legs a little shorter than the remaining segments together. Uropods slightly longer than the last two segments together, the rami subequal and rather less than two-thirds the length of the peduncle. Endopod with one spine on its inner edge about the middle of its length, and another close to the apical spine, which is long and stout; the inner edge between the two spines is coarsely serrated. The exopod has two unequal terminal spines and no setæ on its inner edge.

Remarks.—In having the antennal tooth of the carapace bluntly rounded and in the armature of the uropods this minute species differs from all the other species of the genus. It appears to resemble *B. pulchella* in the disposition of the ridges on the carapace, though these are very obscure.

Occurrence.—Gulf of Siam, "Koh Kam, 5 fathoms." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

Genus Cyclaspis.

The new species described below form, with those already referred to this genus, a somewhat varied assemblage, within which, however, I am unable to define any groups which appear worthy of generic rank. The species of *Cyclaspis* form a very important part of the Cumacean fauna of tropical and southern seas.

Key to the Species of Cyclaspis

(excluding *C. argus* and *C. bistriata* Zimmer, of which I have seen no specimens *).

A. No eye or ocular lobe	*C. longicaudata* G. O. Sars.
B. Eye and ocular lobe present.	
a. Carapace quite smooth.	
a. Peduncle of uropods more than twice as long as the rami	*C. picta* Calman.
b. Peduncle of uropods not much longer than the rami.	
A′. Basis of first legs with a spiniform tooth at its distal end.	
a′. First legs long, propodus twice as long as carpus	*C. hornelli* Calman.
b′. First legs short, propodus equal to carpus	*C. herdmani* Calman.
B′. Basis of first legs without a spiniform tooth at its distal end.	
a′. Carapace one-third of total length	*C. pusilla* G. O. Sars.
b′. Carapace less than one-third of total length.	
1. First legs very long, basis about half as long as distal segments together	*C. longipes*, sp. n.
2. First legs short, basis nearly equal to distal segments together	*C. levis* G. M. Thomson.
b. Carapace more or less strongly ridged or sculptured, or armed with a tooth on the dorsal crest.	
a. Ridges enclosing a quadrilateral depressed area on each side of the carapace.	
A′. Two strong transverse ridges crossing dorsal surface of carapace.	
a′. Transverse ridges thickened	*C. exsculpta* G. O. Sars.
b′. Transverse ridges not thickened, the posterior one with two hooked teeth	*C. persculpta* Calman.

* Two additional species of the genus have been described by Dr. Zimmer since this paper was read (Zool. Anz. xxxi. p. 367, 1907).

B′. No transverse ridges on dorsal surface of carapace.
  a′. A prominent tooth at the posterior lower corner of the lateral enclosed area . . . . *C. elegans*, sp. n.
  b′. No tooth at the posterior lower corner of the lateral enclosed area . . . . *C. similis*, sp. n.

b. Ridges not enclosing a quadrilateral area on the side of the carapace.
  A′. Dorsal crest of carapace with a sharp tooth near anterior end.
    1. Carapace with an oblique lateral ridge . . . . . . *C. uniplicata*, sp. n.
    2. No ridge on carapace . . . . *C. unicornis*, sp. n.
  B′. Dorsal crest of carapace unarmed.
    1. Carapace longitudinally ribbed . . . . *C. costata* Calman.
    2. Carapace with a very prominent encircling ridge anteriorly . . . . *C. cingulata*, sp. n.
    3. Carapace with a single short oblique ridge laterally . . *C. thomsoni*, sp. n.
    4. Carapace with two subparallel oblique ridges laterally . *C. biplicata*, sp. n.
    5. Carapace with two widely divergent oblique ridges . . *C. australis* G. O. Sars.
    6. Carapace with three transverse ridges crossing the dorsal surface and uniting below . . . . *C. sibogæ* Calman.
    7. Carapace with three ridges laterally, the two posterior uniting or dying out before reaching the mid-dorsal line . . . . *C. triplicata*, sp. n.

CYCLASPIS LONGIPES, sp. n. (Plate V. figs. 1–5.)

Description of adult Female.—Total length 3·1 mm.

The carapace is about two-sevenths of the total length, slightly compressed, its vertical height less than two-thirds of its length. The dorsal edge is slightly keeled, most distinctly so in front, and is hardly at all arched as seen from the side. Pseudo-rostrum very short, the ocular lobe reaching quite to the tip. Antennal notch shallow, widely open. Antennal tooth very sharp, almost spiniform. The ocular lobe is very broad and prominent on the dorsal surface.

First leg-bearing somite well exposed. The second has a slight dorsal keel.

Abdomen a little longer than the cephalothoracic region; the somites subcylindrical, with lateral articular processes.

Antennules rather long, the last segment of the peduncle longer than the preceding.

The first legs are very long and slender, extending beyond the tip of the pseudo-rostrum by nearly two-thirds of the length of the carapace. The basis is not much more than half of the length of the distal segments together. The dactylus is shorter than the propodus and longer than the carpus.

The peduncle of the uropods is one and a half times as long as the last somite and is finely serrated on the inner edge. The endopod is about two-thirds as long as the peduncle, with a slender apical spine and five small spines on the distal half of its inner edge. The exopod is one-fourth longer than the endopod, and has a slender apical spine with two spinules at its base and a single slender spine a little way down the inner edge.

Adult Male.—Total length 3·3 mm.

Resembling the female in general form. Carapace a little less deep. The ocular lobe is more swollen and the corneal facets are larger. The antennal tooth is not so sharp. The first leg-bearing somite just visible between the carapace and the second somite. The first legs are long and slender as in the female.

The peduncle of the uropods is of the same relative length as in the female and bears a series of plumose setæ on the inner edge. The rami are less unequal than in the female, the endopod being about five-sixths of the length of the peduncle and the exopod only a little longer. The endopod has ten spinules on its inner edge, and the exopod bears three plumose setæ internally.

Remarks.—The smoothness of the carapace and the presence of five free thoracic somites bring this species into the neighbourhood of *C. picta*, *C. herdmani*, and *C. hornelli* Calman. While resembling the last two in general shape, it differs from them in having the basal segment of the first legs not produced into a distal tooth. *C. picta* differs in the acute pseudorostrum, the more arched carapace, the shorter rami of the uropods, and in the much shorter first legs.

Occurrence.—"Cruz Bay, St. Jan [Danish West Indies]. Chr. Levinsen, 6.1.96." Two specimens. Copenhagen Museum.

CYCLASPIS LEVIS G. M. Thomson. (Plate V. figs. 6–8.)

Cyclaspis levis G. M. Thomson, Journ. Linn. Soc., Zool. xxiv. p. 264, pls. xvi. & xvii. figs. 1–26 (1892).

Description of adult Female.—Total length 7·16 mm.

The carapace is about two-sevenths of the total length, hardly compressed, its vertical height little more than half its length. The dorsal edge distinctly keeled; keel flattened or faintly doubled posteriorly, very little arched as seen from the side. Pseudorostrum very short, the ocular lobe reaching quite to the tip. Antennal notch not widely open and antennal tooth not acute. Ocular lobe slightly prominent on dorsal surface. The surface of the carapace is everywhere beset with shallow and inconspicuous pits. There is a faintly marked ridge running backwards for a short distance from the antennal tooth.

First leg-bearing somite exposed at the sides only. Second with a distinct dorsal keel.

Abdomen a little longer than the cephalothoracic region; the somites subcylindrical, with lateral articular processes, with a median dorsal and slight lateral keels.

Antennules short; the last two segments of the peduncle equal.

First legs of moderate length, extending beyond the tip of the pseudorostrum by less than one-third of the length of the carapace. The basis is hardly shorter than the distal segments together and is not produced into a tooth, but bears two densely plumose setæ at the distal end. The dactylus is a little shorter than the propodus and about equal to the carpus.

The peduncle of the uropods is equal to or very little longer than the last somite. The endopod is a little shorter than the peduncle, acutely pointed at the tip, without an apical spine, with four spinules on its inner edge. Exopod a little longer than endopod, with a small apical spine and plumose setæ on its inner edge.

Adult Male.—The single adult male in the collection is crushed and imperfect. So far as can be seen, however, it differs little from the female except in the usual secondary sexual characters. The corneal facets of the eye are larger, the antennal notch of the carapace is shallower, and the antennal tooth less prominent. The uropods have the peduncle and the endopod fringed with setæ on the inner edge, and the rami are subequal in length.

In immature specimens of both sexes, and apparently also in the adult male, the first leg-bearing somite is quite concealed.

Remarks.—This species resembles the last in having a smooth carapace, the ocular lobe reaching the tip of the pseudorostrum, and the basal segment of the first legs not produced into a distal tooth. It differs in having the first leg-bearing somite only partially exposed, the first legs much shorter, and the peduncle of the uropods hardly longer than the last somite.

The identification of the specimens described above with Mr. G. M. Thomson's species is only possible on the assumption that he was in error in describing the basis of the first legs as ending in a long spiniform process. The two long plumose setæ at the end of the basis in my specimens are often encrusted with mud and matted together so as to form what appears at first sight to be a solid process having very much the shape and proportions of the process figured by Mr. Thomson. Until some other species is discovered agreeing more closely in this respect with Mr. Thomson's figures, his name may be applied to the form here described.

Occurrence.—New Zealand, "Lyttleton Harbour, 1–5 fathoms, 8/97, H. Suter Coll."; "Akaroa Harbour, H. Suter Coll." Copenhagen Museum. "Otago Harbour, surface-net, G. M. Thomson." British Museum.

Cyclaspis elegans, sp. n. (Plate II.)

Description of adult Female.—Total length 6·3 mm.

Resembling *C. exsculpta* Sars and *C. persculpta* Calman in having the carapace strongly sculptured. The carapace is about one-third of the total length, and its vertical height is two-thirds of its length. On each side is a quadrilateral area, answering to the "lateral depressed area" in Sars's description of *C. exsculpta*, bounded by ridges which rise at the corners into four prominent tubercles. There are no transverse crests across the dorsal surface, but there is a well-marked, obscurely granulated, median dorsal keel which rises at its posterior end into a blunt tooth. The depressed area occupies the greater part of the lateral surface; its upper margin is sinuous and its posterior margin nearly parallel to the hinder margin of the carapace. The lower horizontal ridge is produced in front and behind to the edge of the carapace, and the upper is continued forwards on to the side of the pseudorostrum. The greatest width of the carapace is measured between the postero-inferior tubercles. The ocular lobe is little longer than broad and reaches nearly to the tip of the pseudorostrum. The eye is without pigment; there are about nine corneal facets.

The first leg-bearing somite is almost entirely concealed, only a small portion being visible laterally. The second is large, nearly equal in height to the carapace, with a dorsal crest produced backwards into a sharp tooth and with the lateral plates expanded. The posterior thoracic somites have a median dorsal keel, which is continued on all the abdominal somites except the last. There are less distinct dorso-lateral keels on the last two thoracic and the first two abdominal somites. The first five abdominal somites have lateral articular processes anteriorly.

The appendages are very similar to those of *C. australis* as figured by Sars. The antennules are a little more slender and appear to lack all trace of the inner flagellum. The antennæ have a long and slender external process which is not segmented off from the basal part. The mandibles have about eighteen spines on the inner edge. The lower lip has the tip of each lobe sharply bent inwards and armed with a group of peculiar spatulate spines. The palp of the maxillula is about one and a half times as long as the distance between its base and the tip of the distal lobe and bears two long setæ.

The first maxilliped differs from that of *C. australis* in the longer basis, which exceeds in length the other segments together. The terminal segment is very small. The branchial apparatus is well developed; the epipod is produced forwards nearly as far as the end of the basis, and carries about thirteen branchial lobules.

The second maxilliped is slender, its basis exceeding by two-thirds the length of the remaining segments together. There are about twelve long setæ on the basal lamina.

The third maxilliped has the basis sharply bent outwards about the middle of its length. Otherwise it resembles the corresponding limb of *C. australis.*

The first leg does not extend much beyond the tip of the pseudorostrum in the natural position, and its distal segments are not so slender as in *C. australis.*

The remaining legs are similar to those of *C. australis*, but carry longer setæ. The terminal segment of the second pair has three terminal but no lateral spines.

The uropods have the peduncle stout and but little shorter than the last somite. The rami are subequal and about equal in length to the peduncle. The endopod is slightly curved upwards and outwards at the tip; the distal half of its inner edge is strongly serrated and bears a single small pectinate spine. The exopod has a short apical spine and a series of plumose setæ on the inner margin.

Adult Male.—Total length 6·2 mm.

The carapace is about two-sevenths of the total length, its vertical height not much more than one-half of its length. The dorsal outline is less strongly arched than in the female. The ridges defining the depressed area on the lateral surface are less prominent. The tubercles at the two lower corners and that at the anterior upper corner are well-marked, but there is no posterior upper tubercle, and the upper horizontal ridge does not meet the posterior vertical ridge. Seen from above, the carapace is not wider behind than in front. The ocular lobe and the corneal facets which it bears are considerably larger than in the female. The antennal notch is somewhat shallower, and the antennal tooth is slightly different in form.

The first leg-bearing segment is entirely concealed. The second is as high as the posterior part of the carapace. Its dorsal crest is rounded, not produced, and the lateral plates are not expanded. The dorso-lateral keels of the last two thoracic and the first two abdominal somites are more strongly developed than in the female. As usual, the abdominal somites are much stouter than in the female. The fifth somite is laterally constricted in its posterior half.

The antennules are similar to those of the female, with a single additional sensory filament springing from the end of the third segment. The antennæ resemble those of *C. longicaudata* as figured by Sars, except that the distal segment of the peduncle is shorter and stouter and the setæ clothing it are shorter. The branchial apparatus is more fully developed than in the female, the lobules being about seventeen in number.

The pleopods appear to differ from those of *C. longicaudata* in lacking the process from the outer margin of the endopod.

The uropods are longer than in the female. The peduncle is about as long as the last somite and is beset along the whole of its inner edge with plumose setæ. The rami are about equal in length to the peduncle, the inner slightly shorter, and resemble those of the female except that the endopod, as well as the exopod, has its inner edge beset with plumose setæ.

Young Stages.—In a specimen 1·75 mm. in length (Pl. II. fig. 5) there is no trace of the last pair of legs. The integument is well-calcified and brittle. No corneal facets are visible on the ocular lobe, and the lateral articular processes of the abdominal somites are not yet developed. The first leg-bearing somite is entirely concealed. On the side of the carapace the ridges bounding the depressed area are well-marked, but of the four tubercles only the anterior upper one is prominent.

Specimens about 5 mm. in length (Pl. II. fig. 6) have assumed nearly the form of the adult, but the first leg-bearing somite is still concealed. It is noteworthy that at this stage the male resembles the adult female more closely than it does when full-grown.

Remarks.—As already stated, this very beautiful species, which, from the abundance of the material, I have been able to describe with some detail, resembles *C. exsculpta* Sars and *C. persculpta* Calman, but it is at once distinguished from them by the different sculpture of the carapace, especially by the absence of transverse crests on the dorsal surface. In the structure of the appendages it shows great similarity to *C. australis* Sars, while at the same time it seems to present no differences of generic value from the type of the genus, *C. longicaudata* Sars.

Occurrence.—"Lyttleton Harbour, New Zealand, 1–5 fathoms, H. Suter Coll." Many specimens. Copenhagen Museum. Co-types in British Museum.

Cyclaspis similis, sp. n. (Plate III. figs. 1–3.)

Description of adult Female.—Total length 5·75 mm.

Resembling *C. elegans* in shape and general proportion of the body. The lateral depressed area on the carapace is less distinctly excavated, and the only prominent tubercle is that representing the anterior upper tubercle of the species named. The lower horizontal ridge is produced forwards to the edge of the carapace, but posteriorly it is continued with an even curve into the posterior vertical ridge, and does not extend to the posterior edge of the carapace. The posterior vertical ridge at its upper end forks into two branches diverging at an obtuse angle. The anterior one does not reach the ridge which runs backwards from the anterior upper tubercle, so that the upper margin of the depressed area is not completely enclosed. The sides of the carapace posteriorly are more or less rugose.

The first leg-bearing somite is exposed only at the side. The dorsal crest of the second is produced backwards into a large rounded lobe. The remaining somites are similar to those of *C. elegans*, but the dorso-lateral crests are stronger and are continued as far as the penultimate somite.

The thoracic appendages, so far as they can be seen in the undissected specimen, present no conspicuous differences from those of *C. elegans.*

The peduncle of the uropods is shorter than the last somite and is finely serrated internally. The rami are shorter than the peduncle. The endopod is not curved at the tip as in *C. elegans*, and is less strongly serrated internally. The exopod has an apical spine, and some plumose setæ on its inner edge.

An immature male specimen 5·25 mm. in length differs little in general characters from the female described above. The first leg-bearing somite is hidden, and the second is not produced above into a cristiform lobe.

Remarks.—This species resembles *C. elegans,* in company with which it was found. It is distinguished, however, by the different sculpture of the carapace.

Occurrence.—"Lyttleton Harbour, New Zealand, 1–5 fathoms, H. Suter Coll." Copenhagen Museum. Co-type (young) in British Museum.

CYCLASPIS UNIPLICATA, sp. n. (Plate IV. figs. 11–20.)

Description of immature Female.—Total length 4·9 mm.

The carapace is distinctly less than one-third of the total length, somewhat compressed, its vertical height not much more than one-half of its length. The dorsal edge is sharply keeled, only slightly curved as seen from the side, with a prominent forwardly directed tooth overhanging the base of the ocular lobe. On each side of the carapace is a low but sharply marked ridge meeting its fellow about the middle of the dorsal edge and running downwards and forwards in the direction of the antero-lateral corner, which, however, it does not reach. Pseudorostrum short and truncated, the ocular lobe reaching quite to the tip. Antennal notch shallow, widely open. Antennal tooth double, the true antero-lateral angle having external to and below it a sharp spiniform tooth. The ocular lobe not longer than broad; eye pigmented, with about nine corneal lenses.

The first leg-bearing somite is exposed dorsally. The second somite has a slight dorsal keel.

The abdomen is distinctly longer than the cephalothoracic region, subcylindrical, and rather slender.

The antennule has the third segment of the peduncle longer than the second, the first distinctly longer than the other two together. The inner flagellum is distinct.

The first maxilliped has the basis shorter than the distal segments together. The second maxilliped is rather stout, and has also the basis shorter than the distal segments. In the third maxilliped the basis is longer than the distal segments, and its distal process is very long, reaching to the end of the carpus.

The first legs are very long, extending beyond the tip of the pseudorostrum in the natural position by about two-thirds the length of the carapace. The basis is less than two-thirds of the length of the distal segments, and is produced on the lower side of the following segment into a sharp tooth.

The second legs are stout and have the basis shorter than the distal segments together.

In the remaining legs the basis successively diminishes in length, being longer than the distal segments in the third pair and about half their length in the fifth pair.

The peduncle of the uropods is longer by one-fourth than the last somite, equal to the endopod, and shorter than the exopod. The endopod tapers to a sharp point, and has about nine short spines on its inner edge. The exopod has a slender apical spine and three short spines on its inner edge.

Remarks.—In the general shape of the body and in having a tooth at the distal end of the basis of the first legs this species resembles *C. herdmani* and *C. hornelli* Calman, approaching the latter species especially in the length of the first legs and in the armature of the uropods. From both it is distinguished by the oblique ridge and the dorsal tooth of the carapace. F. Müller ('Für Darwin,' p. 54 (English ed.

p. 81), fig. 52) figures the male of a "*Bodotria*" having a single tooth on the dorsal crest. It may possibly have been a species allied to the present.

Occurrence.—Gulf of Siam, "Koh Kam, 5–10 fathoms. Th. Mortensen Coll." Several specimens. Copenhagen Museum. Co-types in British Museum. Two young and imperfect specimens of this species were obtained by Prof. Herdman in Ceylon, and were recorded as "*Cyclaspis* sp." in my Report on his collections (Rep. Ceylon Pearl Fisheries, Royal Society, pt. ii. 1904, p. 160).

CYCLASPIS UNICORNIS, sp. n. (Plate V. figs. 9–11.)

Description of immature Female.—Total length 3·2 mm.

The carapace is about one-third of the total length. The dorsal edge keeled, slightly arched as seen from the side, and armed about a third of its length from the anterior end with a sharp forwardly curved tooth. Pseudorostrum slightly prominent, the ocular lobe reaching quite to the tip. Antennal notch wide; antennal tooth acute, not reaching quite as far forward as the tip of the pseudorostrum. The side of the carapace is rough with small granules.

The first leg-bearing somite is hidden, the second has a slight dorsal crest.

The abdomen is a little longer than the cephalothoracic region. The somites are subcylindrical, with lateral articular processes.

The first legs extend beyond the tip of the pseudorostrum in the natural position for less than one-third of the length of the carapace. The basis is about three-fourths of the length of the distal segments together. The ischium and merus are very stout, the former with the inner edge serrated. The three distal segments are very slender; the carpus and propodus of equal length, and each about one-half longer than the dactylus.

The peduncle of the uropods is longer by about one-quarter than the last somite and has its inner edge finely serrated. The endopod is about two-thirds the length of the peduncle, serrated on the inner edge, with a slender apical spine and four spinules on the inner edge. The exopod is a very little longer than the endopod, has a slender apical spine with a small spinule at its base and another a little way down on the inner side.

Remarks.—In the possession of a single dorsal tooth on the carapace this species resembles the last, but it differs in the absence of the lateral ridge on the carapace and in many other characters. There is also a certain general resemblance to *Stephanomma goesii* Sars. It is stated, indeed, by Sars that in that species the lateral lobes of the pseudorostrum are absent and there is no "frontal fissure"; but I am inclined to suspect that Sars has been misled by the ocular lobe reaching quite to the tip of the pseudorostrum, and that *Stephanomma* will be found not to differ generically from some of the species at present referred to *Cyclaspis*.

Occurrence.—"Cruz Bay, St. Jan" (Danish West Indies). One specimen. Copenhagen Museum.

CYCLASPIS CINGULATA, sp. n. (Plate IV. figs. 1–10.)

Description of immature Female.—Total length 4·2 mm.

The carapace is about two-fifths of the total length, somewhat compressed, its dorsal surface as seen from the side strongly arched, and its posterior margin sloping backwards so as to conceal more or less the first two thoracic somites when viewed from above. It is encircled by a very prominent ridge or collar, which crosses the dorsal surface a little in front of the middle of its length and slopes a little forwards as it passes down each side. In the mid-dorsal line this collar is interrupted by a deep notch. On the dorsal surface of the carapace in the posterior third of its length is a pair of ridges, slightly diverging and becoming more strongly marked posteriorly and bearing a few scattered setæ. External to and below the frontal fissure on each side is a slight prominence. The pseudorostrum is short, horizontal, and the long, narrow, ocular lobe extends quite to the tip, projecting in front of the lateral lobes. The corneal lenses are 11 in number and are grouped on the distal end of the ocular lobe. The antennal notch is small, and the antennal tooth is well behind the tip of the pseudorostrum.

The first leg-bearing somite is well exposed, the fourth and fifth have well-marked dorso-lateral keels, and the fifth has also a slight median keel. The abdomen is about equal in length to the cephalothoracic region and rather stout. All the abdominal somites except the last have strong dorso-lateral keels. The first four have a well-marked dorsal keel which becomes faint on the fifth.

The antennule has the third segment of the peduncle longer than the second, the first about equal to the other two together. The vestigial inner flagellum is very distinct. The antenna appears to lack the external process.

The third maxilliped has the basis little longer than the distal segments together. Its distal process is very long, reaching nearly to the end of the carpus.

The first leg is long, extending beyond the end of the pseudorostrum in the natural position by nearly the length of the last two segments. The basis is about four-fifths of the length of the distal segments together, and is a little produced on the lower side of the following segment. The remaining legs are rather short and stout. In the second pair the basis is less than two-thirds the length of the distal segments together.

The peduncle of the uropods is distinctly shorter than the last somite and has a single small seta on its inner edge. The endopod is a little longer than the peduncle and distinctly longer than the exopod, tapering to a sharp point, and with three small spines about the middle of its inner edge. The exopod has an apical spine and a few very small setæ on its outer and inner margins.

Male.—A single adult male, which may possibly belong to this species, is unfortunately so much damaged that it cannot be described in detail. It agrees with the female in the very long and narrow ocular lobe, but the carapace is smooth, with only a faint trace of the encircling ridge so conspicuous in the female and without the paired dorsal ridges posteriorly. On the lower part of the side of the carapace is a horizontal ridge, also very faint, meeting the encircling ridge anteriorly. The dorso-lateral keels are well-marked on the last two thoracic somites, but the abdominal somites, which are very stout, have no distinct keels. The terminal segments of the first pair of legs are longer and more slender than in the female.

Remarks.—In the sculpture of the carapace this species is quite distinct from any other, and it is not easy to see in what direction its immediate allies are to be sought. In the long and narrow ocular lobe it resembles *C. exsculpta* Sars and *C. persculpta* Calman. In the distinctness of the first leg-bearing somite it approaches especially *C. costata* and *C. picta* Calman.

Occurrence.—Several localities in the Gulf of Siam. "Koh Kam, 5–10 fathoms." "Between Koh Mesan and Cape Liant, 5–8 fathoms." "Tung Kaben, 6 fathoms." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

CYCLASPIS THOMSONI, sp. n. (Plate V. figs. 12–16.)

Description of adult Female.—Total length 6 mm.

The carapace is little more than one-fourth of the total length, slightly compressed, its vertical height little more than half its length. The dorsal edge with a distinct keel, which is flattened or faintly doubled posteriorly, slightly arched as seen from the side, with a slight concavity at the base of the pseudorostrum. Pseudorostrum short; the ocular lobe reaching to or a little beyond the tip of the lateral lobes. Antennal notch rather widely open; antennal tooth triangular. The surface of the carapace is everywhere beset with shallow pits, which in full-grown specimens give it a rugose appearance. On each side, a little behind the middle of its length, is a short groove, limited behind by a faintly marked ridge running obliquely downwards and backwards. A slight ridge runs backwards for a short distance from the antennal tooth.

First leg-bearing somite exposed at the sides only. Second with a distinct dorsal keel. Last three with lateral keels.

Abdomen a little longer than the cephalothoracic region; the somites subcylindrical, with distinct median dorsal and lateral keels and the usual lateral articular processes.

First legs of moderate length, extending beyond the tip of the pseudorostrum by little more than one-fourth of the length of the carapace. The basis is a little shorter than the distal segments together and is not produced into a tooth distally; it bears two densely plumose hairs at its distal end. The dactylus is about two-thirds as long as the propodus and three-fourths as long as the carpus.

The peduncle of the uropods is longer than the last somite by nearly one-third. The endopod is a little shorter than the peduncle, acutely pointed at the tip, without an apical spine, with four spinules on its inner edge. Exopod a little longer than the endopod, with a slender apical spine and a series of plumose setæ on its inner edge.

Adult Male.—Total length 6·75 mm.

Proportions and shape of carapace much as in female, but with pseudorostrum rather less prominent and ocular lobe distinctly projecting beyond the lateral lobes. Surface of carapace smoother than in the female, the pitting less distinct and the oblique groove faintly marked.

First leg-bearing somite quite concealed, fourth with a slight lateral ridge, fifth with a double lateral ridge.

Abdominal somites with median dorsal but no lateral keels.

Proportions of uropods much as in female, but the rami rather less unequal. Endopod with about nine spinules and a series of plumose setæ on its inner edge. Peduncle with its inner edge beset with long plumose setæ.

Remarks.—This species is closely allied to *C. levis* G. M. Thomson, but it differs from the specimens which I refer to that species in the much rougher surface of the carapace and the presence of an oblique groove on each side; in a slightly different outline of the dorsal edge of the carapace, which is distinctly concave at the base of the pseudorostrum; and in certain trifling differences of proportion in the first legs and uropods. In the male, where the oblique grooves of the carapace are inconspicuous, there is a certain similarity of outline to Mr. Thomson's figure of the male *C. levis*, suggesting that his figure may have been drawn from a specimen of the present form. Since he expressly says, however, that the surface of the carapace in *C. levis* is "smooth, destitute of ridges or sculpturing," I have retained his name for the closely allied species to which this description more nearly applies.

Occurrence.—New Zealand, "Bay of Islands, 8 fathoms." A number of specimens, mostly immature, taken at the same time as the type specimens of *C. levis*, were sent to me by Mr. G. M. Thomson.

Cyclaspis biplicata, sp. n. (Plate III. figs. 4–15.)

Description of adult Female.—Total length 4·2 mm.

The carapace is about two-sevenths of the total length, somewhat compressed, its vertical height less than two-thirds of its length. The dorsal edge, seen from the side, is only slightly arched. There is a sharp median dorsal keel which rises at the posterior end into a broad truncated tooth. On each side of the carapace are two parallel ridges, running obliquely forwards and downwards and dying out before reaching the lower edge of the carapace. At their upper ends they converge and meet each other close to the median keel a little behind the middle of the carapace. These ridges, though sharply defined, are not prominent, and hardly interrupt the lateral outlines of the carapace as seen from above. The ocular lobe is a little longer than broad, and reaches nearly to the tip of the pseudorostrum. There are about nine corneal facets, but the eye is without pigment.

The first leg-bearing somite is only visible at the sides. The second has the dorsal crest produced upwards into an acute tooth curving slightly forwards at the tip. The posterior thoracic and the anterior abdominal somites have a median dorsal keel becoming fainter posteriorly.

The antennules have the third segment of the peduncle longer than the preceding, and the inner flagellum represented by a minute vestige. The antennæ have the outer process short and distinctly segmented off from the basal part. The mouth-parts resemble very closely those of *C. elegans*. The first legs extend well beyond the tip of the pseudorostrum in the natural position. The basis exceeds only by about one-fifth the combined length of the distal segments. The terminal segment is equal in length to the preceding. The remaining legs are similar to those of *C. elegans*.

The peduncle of the uropods is a little longer than the last somite and bears five plumose setæ on its inner edge. The rami are subequal and are about equal in length to the peduncle. The endopod has the inner edge serrated and carrying a single small seta near the tip. The exopod has a slender apical spine and several plumose setæ on its inner edge.

Adult Male.—Total length 4·16 mm.

The carapace is less deep than in the female and more compressed. The tooth at the posterior end of the dorsal crest is low and rounded. The oblique ridges on the sides of the carapace are similar in position to those of the female, but less strongly marked and do not meet above. The antennal notch is more widely open and the tooth defining it is more obtuse than in the female.

The first leg-bearing somite is hidden. The second is produced dorsally into an acute forwardly curved tooth, more slender than that of the female.

The first legs have the basis longer by one-half than the distal segments together.

The uropods do not differ in their proportions from those of the female, but the setæ on the inner edge of the peduncle are much more numerous and the inner edge of the endopod is also fringed with setæ.

Remarks.—This species resembles *C. bistriata* Zimmer (Zool. Jahrb., Abth. Syst. xvii. p. 447, 1902), but appears to differ in the outline of the carapace, which has the dorsal edge less curved, in the position of the lateral ridges, and in the longer peduncle of the uropods, which in the species named is shorter than the rami. Except for the absence of the lateral ridges of the carapace, Zimmer's figure of the male *C. argus* (*t. c.* p. 445, fig. A) resembles very closely the male of the present species. Without a re-examination of the type specimens it seems impossible to decide whether one or both of these species may not be identical with that here described.

Occurrence.—"Lyttleton Harbour, New Zealand, 1–5 fathoms, H. Suter Coll." Numerous specimens. Copenhagen Museum. Co-types in British Museum.

Cyclaspis triplicata, sp. n. (Plate III. figs. 16–24.)

Description of adult Female.—Total length 4·0 mm.

Very similar in general form to *C. biplicata.* The carapace is more inflated posteriorly. The two oblique ridges on the side of the carapace have much the same course as in that species, but are much more prominent, while in front of these is a prominent tubercle occupying about the position of the anterior upper tubercle in *C. elegans*, from which a third nearly vertical ridge runs downwards and joins a prolongation of the anterior oblique ridge which turns horizontally forwards to the anterior lower edge of the carapace. The tooth at the posterior end of the dorsal keel is slightly different in shape from that of *C. biplicata* and has the hinder edge finely serrated.

The dorsal crest of the second leg-bearing somite differs from that of *C. biplicata* in having the upper angle blunt, the oblique dorsal edge sinuous, and the posterior angle prominent and overhanging the third somite. The median dorsal keel is very slightly marked on the posterior thoracic and anterior abdominal somites, but a pair of dorso-lateral keels, not seen in *C. biplicata*, are developed on the last two thoracic and the first three abdominal somites.

The antennules have the third segment of the peduncle a little shorter and stouter than in *C. biplicata.*

The first legs are shorter than in *C. biplicata.* The basis exceeds by one-half the combined length of the distal segments. The posterior legs have longer and more numerous setæ.

The uropods are similar to those of *C. biplicata,* but are a little stouter.

Adult Male.—Total length 4·0 mm.

The male closely resembles that of *C. biplicata*, from which, however, it is at once distinguished by the presence of the additional anterior ridge on the carapace. As in the female, this ridge rises above into a blunt tubercle, which is very conspicuous when the carapace is viewed from above. In this species, moreover, the last two thoracic and the first abdominal somites bear strongly marked dorso-lateral ridges, the dorsal tooth of the second leg-bearing somite is shorter and more curved, and the first legs are rather shorter than in *C. biplicata.*

Remarks.—Both in general aspect and in the details of its appendages this species resembles very closely that last described, in company with which it occurred.

Occurrence.—"Lyttleton Harbour, New Zealand, 1–5 fathoms, H. Suter Coll." Many specimens. Copenhagen Museum. Co-types in British Museum.

Genus Eocuma.

I have discussed the characters and the limits of this genus in a former paper (Herdman's Rep. Ceylon Pearl Fisheries, Royal Society, pt. ii. (1904), Suppl. Rep. xii. Cumacea, p. 160). The material now examined reveals the existence of a number of closely allied species. Unfortunately they are represented, for the most part, by immature and sometimes damaged specimens, and it is only after some hesitation that I describe the four new species which follow, leaving aside for the present solitary and more or less imperfect specimens of three species, which may be distinct, from Aden, Trincomalee, and Penang respectively.

The new species have the lateral margins of the carapace carinated and the pseudorostrum projecting in front of the lateral cornua, and they therefore come under the division A. 1 in the key to the genus which I gave in my previous paper (*t. c.* p. 161). This part of the key may be extended as follows to include them :—

a. Antero-lateral teeth of carapace low and rounded (female) or absent (male); no paired ridges on dorsal surface.
- *a′.* (Male.) Cornua of carapace small, directed forwards; antero-lateral margin strongly convex; peduncle of antennule not elongated . . . *E. taprobanica* Calman.
- *b′.* (Male.) Cornua of carapace prominent, directed obliquely outwards; antero-lateral margin only slightly convex; peduncle of antennule much elongated . . . *E. longicornis,* sp. n.

b. Antero-lateral teeth more or less prominent, acute.
- *a′.* Carapace nearly as broad as long, with paired dorsal ridges; antero-lateral teeth reaching nearly or quite as far forward as the pseudorostrum.
  - *a″.* Frontal margin with a small tooth on each side between the pseudorostral lobe and the antero-lateral tooth . . . *E. stellifera,* sp. n.
  - *b″.* Frontal margin without a tooth between the pseudorostral lobe and the antero-lateral tooth.
    - *a‴.* Antero-lateral teeth acutely produced, directed obliquely outwards . . . *E. hilgendorfi* Marcusen.
    - *b‴.* Antero-lateral teeth obtusely triangular, with acute spiniform points directed forwards . . . *E. lata,* sp. n.
- *b′.* Carapace hardly more than half as broad as long, without paired dorsal ridges; antero-lateral teeth not reaching nearly as far forward as pseudorostrum . . . *E. producta,* sp. n.

Eocuma longicornis, sp. n. (Plate VI. figs. 1–6.)

Description of adult Male.—Total length 7·65 mm.

Carapace little more than one-quarter of the total length, its greatest width, excluding the lateral cornua, a little over half its length. Lateral keels well marked. Cornua prominent, directed obliquely outwards, situated behind the anterior third of the length of the carapace. The postero-lateral margins are nearly straight. The width of the posterior margin is about half of that measured between the bases of the cornua. The pseudorostrum is prominent and formed of two rounded lobes. Antero-lateral margins between pseudorostrum and cornua very slightly convex. The transverse ridge on the lower surface on each side is faintly marked and does not reach the lateral margin. Dorsal surface with a faintly marked median ridge posteriorly. The ocular lobe is twice as broad as long, and the pseudorostral plates meet in front of it for a distance much greater than its length. The eye is not pigmented, but there are three large indistinctly defined corneal areas. The surface everywhere shows a regularly reticulated texture, which is not interrupted by a faint and inconspicuous pitting.

Abdomen less than one-third longer than cephalothoracic region, scarcely narrowed posteriorly.

Antennules with very long and slender peduncle ; third segment one and a half times as long as the second and a little longer than the first, about six times as long as broad. External flagellum of three segments, about two-fifths as long as last segment of peduncle.

First legs long and slender. Basis little more than two-thirds of length of distal segments together. Carpus about equal to the propodus and nearly half as long again as the dactylus.

The basis of the second legs has two or three rather coarse serrations on its inner edge near the distal end.

The uropods are more than one and a half times the length of the last somite. The peduncle is about two-fifths of the length of the subequal rami. The inner edges of the peduncle and endopod and both edges of the exopod are fringed with plumose setæ and the endopod also bears three small spinules.

Remarks.—The only species of *Eocuma* of which the male has been described is *E. taprobanica.* From that species the present form is distinguished by the more prominent frontal lobes, the less convex antero-lateral margins, the laterally projecting cornua, the much longer and more slender antennular peduncle, and other characters. It is unlikely that it will prove to be the male of any of the other known species, since, even if the absence of antero-lateral teeth should prove to be only a sexual character, the very narrow carapace and projecting lateral cornua, together with the long first legs, seem sufficient to distinguish it.

Occurrence.—" Suez, 31/1/98, H. Mortensen." Two specimens. Copenhagen Museum.

Eocuma lata, sp. n. (Plate VI. figs. 7–12.)

Description of immature Female.—Total length 3·9 mm.

The carapace is less than two-sevenths of the total length, very broad and flattened, with well-marked lateral carinæ. The greatest width, across the lateral cornua a little behind the anterior third, is very little less than the length. The lateral cornua are short, with acute tips directed forwards. The postero-lateral edges are nearly straight. The width of the posterior margin is less than half that measured across the cornua. The pseudorostrum is prominent, and formed, as seen from above, of two rounded lobes. External to these on each side the antero-lateral margin forms an obtusely triangular tooth with an acute spiniform point, turned forwards, not reaching so far as the level of the pseudorostral lobes. Between this antero-lateral tooth and the lateral cornu the margin is nearly straight. The dorsal surface is slightly arched and has no distinct median keel, but a pair of well-marked dorso-lateral keels running from about the posterior ends of the frontal suture to the hind margin. On the underside a transverse ridge runs from a little behind the lateral cornu to the free margin of the carapace. The ocular lobe is not broader than long and the pseudorostral plates meet in front of it for a distance greater than its length. The eye is not pigmented and no corneal facets were observed.

The surface of the carapace is beset with shallow pits which interrupt as clear spots the minute reticulate texture of the exoskeleton. The centre of each pit is occupied by a minute granule (or perhaps a pore).

The slender abdomen is longer by more than one-fourth than the cephalothoracic region. The fifth somite is about three and a half times as long as broad. The last somite is depressed and expanded laterally, being, at its posterior end, one and a half times as broad as the preceding somite. The antennules have the first segment of the peduncle longer than the other two together, the third not quite half as long again as the second and less than three times as long as broad.

The distal segments of the first legs are together about one and three-quarters as long as the basis. The carpus is equal to the propodus and nearly one-third longer than the dactylus.

The uropods are about two-thirds longer than the last somite. The peduncle is a little more than one-third of the length of the subequal rami. There is a plumose seta on the inner edge of the peduncle and another, along with three spinules, on the inner edge of the endopod.

Remarks.—The specimens here described are very immature as compared with the sub-adult specimens of *E. taprobanica* formerly described. This is shown especially by the characters of the branchial apparatus, which has only about eleven lobules, becoming very small posteriorly, and probably also by the fact that there is no spine on the ischium of the second legs. Further, the outline of the carapace has a distinct resemblance to that of the young specimens of *E. taprobanica* (*t. c.* pl. i. fig. 5). I believe, however, that the present species is sufficiently distinguished by the greater breadth of the carapace and by the presence of two dorso-lateral keels, since these characters are not likely to be greatly modified in the adult. *E. hilgendorfi*, which also possesses dorso-lateral keels, can hardly be the adult stage of the present form, since it has the antero-lateral teeth greatly produced, while, from the analogy of *E. taprobanica*, we should expect these teeth to become less prominent as development proceeds.

Occurrence.—Gulf of Siam, "Koh Kam, 5–10 fathoms," "Between Koh Mesan and Cape Liant, 5–8 fathoms." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

Eocuma stellifera, sp. n. (Plate VI. figs. 13–17.)

Description of immature Female.—Total length 5·6 mm.

Carapace little more than one-quarter of the total length, very broad and flattened, with well-marked lateral carinæ. The greatest width, across the lateral cornua at about the anterior third of the carapace, is about eight-ninths of the length. The lateral cornua are rather stout and incurved at the tips. The postero-lateral edges are slightly concave. The width of the posterior margin is about two-fifths of that measured across the cornua. The pseudorostral lobes are not very prominent; each is rounded at its inner end, then concave, and what may be regarded as its outer end forms a low rounded tooth over the base of the antennule. External to this, and separated from it by a concavity of the margin, is the antero-lateral tooth, which is acute and produced forwards as far as the level of the frontal lobes. Between the antero-lateral tooth and the lateral cornu the margin is nearly straight. The dorsal surface is slightly arched and has a slight median keel posteriorly. Paired dorso-lateral keels are also present, but are not so marked as in *E. lata*. On the underside the transverse ridge is much as in *E. lata*. The ocular lobe is broader than long and the pseudorostral plates meet in front of it for a distance greater than its length. The eye is not pigmented and no corneal facets were observed. The surface of the carapace is closely beset with shallow pits, and the meshes of the primary reticulated texture of the exoskeleton are arranged in a more or less regular radial manner around each pit. Under a moderate magnification the carapace appears covered with stellate clear spots.

The proportions of the abdomen are much as in *E. lata*.

The antennules have the first segment of the peduncle longer than the other two together and the third longer than the second.

The first legs are very long and slender. The distal segments are about two and a half times as long as the basis. The latter has its distal process very long and acute and directed obliquely inwards. The carpus is one-quarter longer than the propodus and more than twice as long as the dactylus.

The uropods are little more than one-third longer than the last somite. The peduncle is a little more than one-third of the length of the subequal rami. There are three plumose setæ and three spinules on the inner edge of the endopod and a minute seta on the inner edge of the peduncle.

A younger specimen, 3·7 mm. in length, agrees with that described above in the form of the carapace.

Remarks.—The specimens described above, though immature, differ so much from the species hitherto described in the shape of the frontal region of the carapace, in the great length of the first pair of legs, and in the stellate texture of the integument, that there can be no doubt of their specific distinctness.

Occurrence.—Gulf of Siam, "Between Koh Mesan and Koh Chuen, 15 fathoms," and "Between Koh Mesan and Cape Liant, 8 fathoms." Th. Mortensen Coll., Copenhagen Museum.

EOCUMA PRODUCTA, sp. n. (Plate VI. figs. 18–20.)

Description of immature Female.—Total length 4·6 mm.

Carapace a little over one-quarter of the total length, flattened and with well-marked lateral carinæ. The greatest width, across the lateral cornua at a little behind the anterior third of the carapace, is a little more than half the length. The lateral cornua are not very prominent, with the tips directed forwards. The postero-lateral edges are slightly convex. The width of the posterior margin is nearly two-thirds of that measured across the cornua. The pseudorostral lobes are rounded and very prominent, projecting far in front of the antero-lateral teeth, which are small and blunt. Between the antero-lateral tooth and the lateral cornu the margin is straight. The dorsal surface is slightly arched and is without distinct median or dorso-lateral keels. The transverse ridge on the underside is faintly marked. The ocular lobe is longer than broad and the pseudorostral plates meet in front of it for a distance greater than its length. The eye is not pigmented. The integument is thin and transparent and minutely reticulated.

The antennules were not dissected out, but they have the peduncle rather elongate, the last segment being about four times as long as broad.

The first legs are rather short, extending but little beyond the pseudorostrum. The basis is four-fifths of the length of the distal segments together. The carpus is a little shorter than the propodus and a little longer than the dactylus.

The basis and ischium of the second legs have several teeth on the inner edge.

The uropods are longer by nearly two-thirds than the last somite. The peduncle is less than one-third of the length of the subequal rami. The inner edges of the peduncle and of the proximal half of the endopod are beset with plumose setæ and the distal half of the endopod carries two spinules.

Remarks.—The specimen described above is distinguished from all the species of which the females are known by the narrow carapace and the very prominent pseudorostrum. In general shape it shows some resemblance to the much larger male specimen described above as *E. longicornis*, and it also approaches that species in the elongate peduncle of the antennule. It is distinguished, however, not only by the marked antero-lateral teeth, but by the shorter first legs.

Occurrence.—"Penang, Didrichsen." Copenhagen Museum.

Genus Zygosiphon, gen. nov.

Carapace with double pseudorostral projection and two widely separated and very long branchial siphons. Five leg-bearing somites distinct. Basis of third maxillipeds produced distally. Only the first pair of peræopods with exopods. Endopod of uropods of two segments, distal segment short.

Type species *Z. mortenseni*, sp. n.

This new genus is distinguished chiefly by the remarkable development of the branchial siphons and their separation from one another, and by the correlated peculiarities in the shape of the anterior part of the carapace. In other respects it does not differ very strikingly from some of the existing genera of Bodotriidæ.

Zygosiphon mortenseni, sp. n. (Plate VII. figs. 1–19.)

Description of adult Female.—Total length 2·67 mm.

The carapace is about two-sevenths of the total length, somewhat compressed, its vertical height two-thirds of its length. The dorsal edge is slightly arched and rises in a rounded transverse ridge posteriorly. Viewed from above, the carapace is rather broader in front than behind, with nearly straight or, in ovigerous specimens, concave sides. In front it is squarely truncate, having at the corners, which are somewhat produced, the two widely separated branchial orifices from which are protruded the very long branchial siphons directed obliquely upwards and outwards. There are thus two short pseudorostral processes instead of one. Seen from the side they are obliquely truncated, with the lower corner projecting in front of the upper. The lateral pseudorostral plates meet for a short distance in front of the ocular lobe. The antennal notch is rounded and widely open, and the antennal tooth is triangular and rather prominent. The ocular lobe is very broad, with its anterior margin notched so as to indicate a division into two parts. It contains two separate masses of ocular pigment, but there are no distinct corneal lenses. On each side of the carapace is a lozenge-shaped depression bounded by indistinctly marked ridges. From its anterior corner a ridge runs forward on to the side of the pseudorostrum, and above this the surface is slightly excavated on each side of the middle line.

The first leg-bearing somite is completely exposed, and, like the second, is nearly equal in height to the posterior part of the carapace. The three posterior somites are much lower and diminish rapidly in width posteriorly. In ovigerous specimens the greatest width of the body is reached at the second free somite.

The abdomen is longer than the cephalothoracic region, the somites subcylindrical and having well-developed lateral articular processes.

Antennule having the first segment of the peduncle longer than the other two together, the third twice as long as the second. The accessory flagellum is represented by a minute nodule; the outer flagellum has two segments. Antennæ simple, unsegmented and without a terminal process, bearing two plumose setæ.

Mandible of the usual form, bearing about twelve spines. Lower lip not seen.

Maxillular palp longer than the distance from its base to tip of distal lobe, with two terminal setæ.

The first maxilliped has the basis much shorter than the remaining segments together. The posterior portion of the branchial apparatus proved very difficult to isolate, but its lobules are very slightly developed, only two small papillæ being observed. The anterior portion, however, is remarkably developed, its distal part forming a long siphon capable of extension and retraction. The proximal part or stalk is, as usual, strengthened by a chitinous rod, with which is connected distally a spoon-shaped plate acting as a valve to close the branchial aperture. Beyond this the tubular portion is formed by a broad and very long strip of transparent membrane rolled up into a spiral with numerous coils "telescoped" into each other. This membrane is marked along its length by parallel striæ or plications, which form a complex spiral pattern when it is rolled up. When fully extended the siphon projects beyond the branchial aperture for a distance equal to at least twice the width of the anterior part of the carapace; when the coils are closed together it forms a short cone protruding from the opening. Very often in the preserved specimens the siphons are unequally extended on the two sides.

The second maxillipeds have the basis shorter than the remaining segments together. The basal plate bears four long setæ on its distal edge and one short seta externally.

The third maxilliped has the basis rather sharply bent, the proximal part being about half as long again as the distal measured along the inner edge. It is produced externally beyond the articulation of the ischium into a pointed lobe, which is nearly two-thirds as long as the segment itself and which bears a row of plumose setæ on its inner edge and another on its lower surface. The merus is about half as long as the ischium along its inner edge and is expanded externally into a very large curved lobe, bearing a long feathered seta at its tip. The terminal segment is very small, little more than half the length of the preceding.

The first legs have the penultimate segment extending a little beyond the pseudorostrum. The basis is about two-thirds as long as the remaining segments together, with a small tooth at the distal end of its outer edge and a long plumose seta internal to it. The terminal segment is about half the length of the preceding.

The second legs are stout and not shorter than the succeeding pair. They have all seven segments distinct. The basis is a little shorter than the remaining segments together. The carpus and propodus are short and subequal, and together equal the ischium in length. The terminal segment is longer than the ischium, about three times as long as broad, and armed distally with three long and some shorter spines.

The remaining pairs of legs diminish in length posteriorly, the basis of the last pair being not much more than half as long as that of the third pair.

The uropods are slender, the peduncle slightly curved and longer by one-third than the last somite. The exopod is nearly three-fifths of the length of the peduncle and terminates in two unequal spines; its inner edge bears one or two long feathered setæ. The endopod is three-fourths as long as the exopod, composed of two segments, the distal little more than one-third of the length of the proximal; it terminates in a long spine and has three short spines on its inner edge.

Adult Male.—Total length 2·7 mm.

The carapace is about one-fourth of the total length, its vertical height less than two-thirds of its length. Seen from the side it differs from that of the female in having the dorsal outline less strongly arched and not elevated at the posterior end. The ridges on the side of the carapace are only faintly indicated and the surface is smoother than in the female. The ocular lobe is much larger and more prominent. The eye is deeply pigmented and not completely separated into two portions; nine large corneal lenses are visible from above.

The first and second leg-bearing somites are subequal in height and much lower than the posterior part of the carapace.

The abdominal somites are much stouter than in the female, with well-marked pleural plates fringed with rather long hairs posteriorly.

The antenna is of the usual structure and its flagellum is equal in length to the body.

The branchial apparatus differs greatly from that of the female, having about nine very broad lamellar lobules, increasing in size posteriorly and each truncate at the tip. The branchial siphon is similar to that of the female.

The first leg has the basis longer than in the female, about equal in length to the remaining segments together.

The pleopods are of the usual structure.

The peduncle of the uropods is a little shorter than in the female and the exopod is a little more than three-fifths of its length. The inner edge of the peduncle has a fringe of feathered setæ. The endopod has six spines on the inner edge.

Remarks.—The two long branchial siphons projecting from the anterior corners of the head give this species a very remarkable appearance and distinguish it at once from any Cumacean hitherto described. Apart from the branchial system, however, its structure does not seem to be in any way unusual.

The separation of the two branchial siphons, though nowhere else so marked, will, I believe, be found to be not uncommon among the Cumacea. Sars describes (Crust. Norway, iii. p. 6) the anterior part (exopod) of the branchial apparatus as uniting with its fellow of the opposite side to form "a funnel-shaped tube," and in his description of *Nannastacus longirostris* (Arch. Math. Naturvid. iv. p. 122) he states that this species differs from all other Cumacea in having two distinct siphons. This is a point which is very difficult to determine in preserved specimens, especially if the dissection has to be directed to the examination of other characters as well, but I have observed it in Cumacea belonging to widely distinct families and am inclined to suspect that it may even prove to be the rule. I hope to return to this point on a future occasion.

Occurrence.—Gulf of Siam, "Between Koh Mesan and Cape Liant, 5–9 fathoms," "Koh Kam, 5–10 fathoms." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum. A solitary young specimen was obtained by Prof. Herdman in the Gulf of Manaar and is referred to in my Report on his collection (Rep. Ceylon Pearl Fisheries, Royal Society, pt. ii. (1904), Suppl. Rep. xii. Cumacea, p. 160) as "Bodotriidæ n. g. and sp."

IPHINOË sp.

Two immature specimens of a species of this genus, the larger only 4·4 mm. in length, are in the collection from the Gulf of Siam. In having the carapace more than twice as long as deep they differ from all the species hitherto described except *I. serrata* Norman (non Sars) and *I. brevipes* Hansen. The latter has the carapace three times as long as deep, and differs widely in many other characters. With *I. serrata* the present specimens agree in having a series of teeth on the outer edge of the basis of the first pair of legs. In co-typical specimens of Norman's species the carapace is two and a half times as long as deep, but in a specimen from the Mediterranean which I refer to this species the proportion approaches that of the Siamese specimens, where it is about two and a fifth. Other characters, such as the longer last segment of the antennular peduncle and the shorter and stouter uropods, may perhaps be due to the immaturity of these very small specimens, to which, for the present, I prefer not to assign a specific name.

Occurrence.—Gulf of Siam, "Koh Kam, 10 fathoms, 4/2/00," "Between Koh Mesan and Cape Liant, 5–8 fathoms, 7/2/00." Th. Mortensen Coll., Copenhagen Museum.

Family VAUNTOMPSONIIDÆ.

Dr. H. J. Hansen has suggested (Isopoden, Cumaceen, &c. der Plankton-Expedition, p. 57) that this family ought probably to be united with the preceding. I have also discussed some facts pointing in the same direction (Cumacea of Siboga Exp. p. 8). For convenience, however, the name is here retained pending a general reconsideration of the classification of the Cumacea.

VAUNTOMPSONIA CRISTATA Spence Bate.

Vauntompsonia cristata G. O. Sars, Arch. Math. Naturvid. iv. p. 13, pls. xxiii.–xxvi. (1879); Calman, Fisheries, Ireland, Sci. Invest. 1904, i. (1905), p. 17, pl. i. fig. 1.

To this species I refer, not without some hesitation, a number of male specimens from the West Indies. They differ from British and Mediterranean specimens in their much smaller size (not exceeding 3, as against 5 mm.), but no differences of structure can be detected by a careful examination except that the peduncle of the uropods is relatively shorter and thicker, being shorter than the exopod and less than four times as long as thick.

Occurrence.—" Cruz Bay, St. Jan " (Danish West Indies), " Chr. Levinsen, 6/1/96." About twenty specimens, all males. Copenhagen Museum.

VAUNTOMPSONIA ARABICA, sp. n. (Plate VII. figs. 20–24.)

Description of adult Male.—Total length 3·1 mm.

The carapace is distinctly more than one-fourth of the total length, its vertical height about two-thirds of its length. Seen from the side the dorsal edge is distinctly arched. Pseudorostrum very short and truncated. Anterior edge without teeth. Antero-lateral angle obtuse, with a single inconspicuous denticle.

The anterior lobe of the fifth leg-bearing somite is broader, and the notch defining it above is less distinct than in *V. cristata*.

The abdomen is about equal in length to the cephalothoracic region and is stouter than in *V. cristata*.

The antennules have the peduncle shorter and stouter than in *V. cristata*, the second segment is without the stout setæ present in the male of that species, and the third segment is longer than the second.

The third maxilliped has the basis without serrations on its inner edge.

The first legs are considerably shorter than in *V. cristata*, extending beyond the pseudorostrum by little more than the length of the terminal segment. The basis is two-thirds of the length of the distal segments together. The dactylus is two-thirds as long as the carpus and little more than half the length of the propodus.

The second legs have the basis about equal to the distal segments; the last segment is less than four times as long as broad and not longer than the two preceding segments. The posterior legs, and especially their basal segments, are relatively shorter than in *V. cristata*.

The uropods have the peduncle equal in length to the terminal somite and rather less than four times as long as thick, with eight subequal spinules and a longer distal one on its inner edge. The exopod is equal to the peduncle, with three minute spines on its outer edge, one long and two short spines terminally and one small spine on the inner edge. The endopod extends beyond the exopod by half the length of its distal segment. The proximal segment has about ten subequal spines and a stronger distal one on its inner edge, and a minute distal spinule externally. The distal segment has one long and two short terminal spines and a small spinule on the inner edge.

The pigmentation is variable; patches are generally present on the back and sides of the carapace, and some specimens have dendritic spots on the sides of the abdominal somites.

Remarks.—This species is very closely allied to *V. cristata*, but it appears to differ in a number of small characters, of which the convex dorsal edge of the carapace and the shorter first legs are the most conspicuous.

Occurrence.—"Suez Canal, 31/1/98, H. Mortensen"; "Aden, 2/98, H. Mortensen." Copenhagen Museum. Co-types in British Museum.

LEPTOCUMA KINBERGII G. O. Sars.

Leptocuma kinbergii G. O. Sars, Kongl. Svenska Vet.-Akad. Handl. ii. no. 5, p. 24, pl. vi. (1873).

The specimen which I refer to this species is a female with developing but empty brood-pouch. It measures 22·5 mm. in length of body, and is thus more than half as long again as Sars's immature specimen. It differs from the latter in the following particulars:—

The carapace is less deep, its vertical depth being less than two-thirds of its length, its lower edge is less convex, and the antero-lateral margin as seen from the side is proportionately deeper. The ocular lobe reaches quite to the tip of the pseudorostrum, and the dorsal edge of each lateral plate, where it lies against the ocular lobe, is convex instead of concave. The antennal notch is much shallower than in Sars's figure. The pleural plates of the third free thoracic somite are produced backwards on each side as large rounded lobes, and those of the fourth somite are similarly but less strongly produced, while the last thoracic and the first four abdominal somites have the lower hinder corner slightly produced. The appendages, so far as they are preserved and can be seen without dissection, agree in general with those of Sars's specimen. The second leg, however, appears to be longer, reaching as far as the anterior margin of the carapace in the natural position. The posterior legs are somewhat shorter and more robust. The uropods differ from the figure given by Sars in having setæ on the outer edge of both segments of the endopod, and in having the distal segment little shorter than the proximal, while in Sars's figure it is about two-thirds of that length.

In view of the much smaller size and the immaturity of the type-specimen, the characters in which it differs from the present specimen cannot be regarded as of specific value.

Occurrence.—"Magelhaës Strædet, Schythe." Copenhagen Museum. 1 specimen.

Family LEUCONIDÆ.

The new genera which are described below render necessary some important modifications in the definition of this family. While all the forms hitherto described agree in having exopods on the first three pairs of legs in the female and on the first four in the male, and in having two pairs of pleopods in the latter sex, the species now described from New Zealand show that the thoracic exopods may be reduced to two pairs in both sexes, and the male pleopods may be present as a single pair or altogether absent. Further, the division of the endopod of the uropods into two segments may be indistinct or suppressed.

The fact that, in some of the species, the ischium of the second pair of legs is distinctly developed (as in Zimmer's *Pseudoleucon*) cannot be made use of as a generic character, since *Heteroleucon akaroënsis* and *Leucon* (?) *heterostylis* present an intermediate condition in which the segment in question is developed only as a very narrow and incomplete ring of chitin between the basis and merus. I find the same structure in *Leucon nasica* Kröyer, *L. assimilis* Sars, and *L. longirostris* Sars, and possibly this vestigial segment has been overlooked in other members of the genus. I cannot identify it, however, in the species of *Eudorella* and *Eudorellopsis* which I have examined. It is noteworthy that the disappearance of the segment is thus shown to be due to "excalation," not, as Sars says (Crust. Norway, iii. p. 29), to fusion with the merus.

In other respects, especially in the structure of the mouth-parts, the new forms agree with the Leuconidæ already known. The inconvenience of genera distinguished only by the characters of one sex is sufficiently obvious, and indeed, in the case of one of the species described below, I have been unable to decide as to its proper generic position owing to the fact that no male specimens were found. Apart, however, from the frequent use of such distinctions in other groups of animals, a precedent is afforded among the Cumacea by Sars's genus *Hemilamprops*, which is distinguished from *Lamprops* only by the characters of the male.

The following key will serve to indicate the position which the new genera occupy relatively to the other genera of the family :—

A. First three pairs of legs in female and first four in male carry exopods.
  a. Two pairs of pleopods in male.
    a. Antennules not geniculate . . . . *Leucon* Kröyer.
    b. Antennules geniculate between second and third segments of peduncle . . . . *Eudorella* Norman.
    c. Antennules geniculate between first and second segments of peduncle.
      a′. Pseudorostrum obsolete or short, vertical, and truncated . . *Eudorellopsis* Sars.
      b′. Pseudorostrum long, oblique, and acute. . . . . *Pseudoleucon* Zimmer.

b. One pair of pleopods in male . . . . *Paraleucon,* g. n.
c. No pleopods in male . . . . *Hemileucon,* g. n.
B. First two pairs of legs only carry exopods in both sexes. No pleopods in male . . . . *Heteroleucon,* g. n.

LEUCON (?) HETEROSTYLIS, sp. n. (Plate VIII. figs. 1–5.)

Description of adult Female.—Total length 3·42 mm.

Carapace a little over one-fifth of total length, its vertical height less than two-thirds of its length. The dorsal edge is nearly straight, coarsely and somewhat irregularly serrated in the anterior half, with a small denticle near the posterior end and in front of it a shallow depression. Pseudorostrum straight, horizontal, acute, measuring along its upper edge about one-fourth of the total length of the carapace. The antennal notch forms a deep rounded sinus in the antero-lateral margin, which, above the notch, is cut into about four coarse teeth. On the antero-lateral corner begins a series of strong acute teeth, diminishing to faint serrations on the lower margin. The side of the carapace is smooth. The abdomen is longer than the cephalothoracic region and stout, the first two somites being not longer than broad.

The antennules have the first segment of the peduncle longer than the second, which is again a little longer and stouter than the third. The outer flagellum is a little longer than the last segment of the peduncle and is composed of three segments, the first and second subequal and the third minute. The inner flagellum is unsegmented and is nearly equal to the first two segments of the outer flagellum together. The antennæ are composed of three segments, the basal one bearing three plumose setæ.

The branchial apparatus has two small papilliform lobules on its posterior part.

The first legs are imperfect in all the specimens examined.

The second legs have the ischium represented by two very narrow semiannular sclerites interposed between the basis and merus, forming a ring which is interrupted on the inner and outer sides.

The uropods have the peduncle longer than the last somite and about three times as long as broad. The rami are very unequal, the exopod being shorter than the peduncle and little more than half the length of the endopod. The latter is composed of two segments, the proximal two and a half times as long as the distal. There are about ten slender spines on the inner edge and two unequal spines at the tip, while the outer edge bears a series of stout setæ. The exopod bears a series of long setæ on the inner edge and at the tip and some short setæ on the outer edge.

Remarks.—In the absence of the male it is impossible to decide whether this species ought to be referred to some of the new genera defined below. Its resemblance, however, in such characters as the shape of the antero-lateral edge of the carapace, to *L. longirostris* Sars leads me to believe that it will be found to belong to the genus

Leucon. In that case it will fall into the group of species which have a large inner flagellum on the antennule. From all the species of this group it is distinguished by having the outer rami of the uropods shorter than the first segment of the inner.

Occurrence.—"Akaroa Harbour, 8/97, 6 fathoms, H. Suter." Copenhagen Museum.

Eudorella truncatula (Spence Bate).

Eudorella truncatula G. O. Sars, Crust. Norway, iii. p. 37, pl. xxix. (1900).

I am unable to find any differences of importance by which to distinguish three New Zealand specimens from North Atlantic specimens of this species. They are of small size, an ovigerous female measuring only 2·75 mm. in total length. The armature of the antero-lateral margin of the carapace resembles that found in *E. truncatula* and in *E. pusilla* (the distinctness of these two species appears to me doubtful), but the tooth of the antero-lateral angle is a little more prominent, though much less so than in *E. nana* or *E. hispida*. The second legs have the basis not much shorter than the remaining segments together, and the merus and carpus relatively shorter than in northern specimens of *E. truncatula*. The terminal spine of the endopod of the uropods is also somewhat stronger.

Occurrence.—"Akaroa Harbour, H. Suter Coll., 8/97." 3 specimens. Copenhagen Museum.

Eudorellopsis resimus, sp. n. (Plate VIII. figs. 6–10.)

Description of adult Female.—Total length 1·75 mm.

General form much as in *E. deformis* (Kröyer). Pseudorostrum well-marked, directed upwards with a slight inclination forwards, distal end truncated, posterior corner not produced, length along posterior edge about one-fourth of total length of carapace. Posterior part of dorsal edge of carapace carrying a prominent tooth directed obliquely forwards. Antero-lateral edge coarsely serrated, the teeth becoming lower and more irregular on the upper part, lower part curving backwards and ending in a small tooth defining the antennal notch. The side of the carapace bears, above the middle of its height, a longitudinal ridge which curves upwards to the anterior edge of the pseudorostrum.

The antennules are more slender than in *E. deformis* and bear less numerous spines. The outer flagellum, composed of three segments, is shorter than the last segment of the peduncle. The unjointed inner flagellum is equal in length to the first segment of the outer.

First legs short, reaching beyond the anterior end of the carapace by not more than the length of the last segment, less richly setose than in *E. deformis*. Second legs also short, with carpus half as long as merus and equal to propodus.

Uropods short and stout, peduncle about two-thirds as long as the last somite.

Exopod nearly twice as long as the peduncle, roughened on its outer surface with irregular tubercles or blunt teeth, with two unequal spines at the tip and a single seta on the inner edge. Endopod only a little shorter than the exopod; first segment twice as long as the second, the latter with a long stout terminal spine and a smaller one internal to it, inner edge unarmed.

Remarks.—This species differs from the two species of the genus already known in having the pseudorostrum produced vertically and in possessing a lateral longitudinal ridge on the carapace. In the large size of the pseudorostrum it approaches the genus *Pseudoleucon* of Zimmer, and suggests that that genus should not be separated from *Eudorellopsis.*

Occurrence.—"Lyttleton Harbour." 1 specimen. Copenhagen Museum.

Genus Heteroleucon, gen. nov.

Only the first and second pairs of legs have exopods in either sex. The endopod of the uropods is unsegmented. The male has no pleopods.

Type species *H. akaroënsis*, sp. n.

The general form of the body is that of the genus *Leucon*, the carapace having a prominent pseudorostrum and a serrated dorsal crest (in the female). The very oblique pseudorostrum recalls the genus *Pseudoleucon* of Zimmer, from which, however, the present form is distinguished by the fact that the peduncle of the antennules is not sharply geniculate between the first and second segments.

Heteroleucon akaroënsis, sp. n. (Plate VIII. figs. 11–23.)

Description of adult Female.—Total length 2·75 mm.

Carapace a little less than one-fourth of total length, compressed, its vertical height about two-thirds of its length. The dorsal edge is slightly arched as seen from the side, keeled, serrated in its anterior half with eight to ten teeth, and with a single larger tooth just in front of the posterior margin. In front of the posterior tooth there is generally a shallow rounded excavation of the dorsal edge, but in some cases this is less marked than in the specimen figured. The pseudorostrum is straight, directed obliquely upwards, and sharply pointed. The length of its upper edge is a little less than one-third of the length of the carapace. The antennal notch forms a, rather shallow rounded sinus in the antero-lateral margin, which has one or two teeth above the notch and below it is coarsely serrated and curves backwards into the lower margin without any distinct antero-lateral angle.

The abdomen is rather stout and is a little shorter than the cephalothoracic region.

The antennules have the first two segments of the peduncle very stout and subequal, the third only half the diameter of the second and two-thirds of its length. The outer flagellum is about equal to the second segment of the peduncle and consists of two segments. The unjointed inner flagellum is equal in length to the first segment of the outer.

The antennæ are composed of three segments. The proximal segment bears two plumose setæ.

The mouth-parts are of the usual Leuconid type.

The posterior division of the branchial apparatus bears only two small papilliform lobules.

The first legs extend beyond the pseudorostrum by nearly the length of their two distal segments. The basis is about two-thirds as long as the distal segments together.

The second legs have the basis shorter than the remaining segments together; the ischium is represented by a narrow chitinous ring between the basis and merus.

The uropods have the peduncle longer than the terminal somite and about three times as long as thick. The rami are subequal and a little longer than the peduncle. The exopod is obliquely truncated at the tip, which bears about five unequal setæ. The endopod has a strong, dorsally curved, apical spine and about ten spines on its inner edge.

Description of adult (?) *Male.*—Total length 1·65 mm.

Carapace one-fourth of total length, its vertical height about four-fifths of its length. Dorsal edge slightly arched, smooth, or with one or two small serrations anteriorly. Pseudorostrum very short, horizontal, broadly rounded at the tip. No antennal notch. Antero-lateral angle broadly rounded and serrated.

Antennules with three segments in outer flagellum.

Antennæ with flagellum very short, not longer than the peduncle, composed of nine segments. It is thickened at the base, where the segments are indistinctly separated, but distally they are slender and well-formed and provided with sensory setæ.

The remaining appendages do not differ greatly from those of the female.

The peduncle of the uropods is little more than half the length of the rami.

Remarks.—Though there can be little doubt that the males described above belong to the same species as the females, their much smaller size is very suggestive of immaturity, and to this cause may be due the remarkable shortness of the antennæ. The antennæ, however, do not show the usual characters of immaturity, for the peduncle is beset with sensory filaments, and the flagellum, though short, is distinctly segmented and carries setæ.

Occurrence.—"Akaroa Harbour, 6 fathoms, H. Suter Coll., 8/97": many females and three males. "Lyttleton Harbour, 1–5 fathoms, H. Suter Coll., 8/97": many females. Copenhagen Museum. Co-types in British Museum.

Genus Paraleucon, gen. nov.

Differing from *Leucon* in having only one pair of pleopods in the male sex.

Type species *P. suteri*, sp. n.

The species described below resembles *Heteroleucon akaroënsis* in the arrangement of the teeth on the dorsal crest of the carapace. The segmentation of the endopod of the uropods is much less distinct than in most other Leuconidæ, and may be regarded as forming a transition to the unsegmented condition found in *Heteroleucon*. The number of thoracic exopods, however, and the presence of a pair of pleopods in the male seem to require that this species should be distinguished generically from the last.

Paraleucon suteri, sp. n. (Plate IX. figs. 1–20.)

Description of adult Female.—Total length 2·9 mm.

Carapace more than one-fifth of total length, compressed; its vertical height a little more than two-thirds of its length. The dorsal edge is nearly straight as seen from the side, keeled, with a large tooth near the hind margin overhanging a rounded excavation, in front of which the dorsal keel bears a varying number of irregular serrations. The pseudorostrum is straight, directed obliquely upwards, and sharply pointed. The length of the upper edge is less than one-fourth of the total length of the carapace. The antennal notch is well-marked and angular, defined below by a triangular tooth, below which the anterior part of the lower margin is obscurely serrated. On the side of the carapace are three subparallel ridges curving obliquely downwards and forwards.

The abdomen is longer than the cephalothoracic region.

The antennules have the first segment of the peduncle little stouter than the second and shorter than the second and third together. The outer flagellum is composed of three segments and is shorter than the third segment of the peduncle. The inner flagellum is unsegmented and about equal to the first segment of the outer.

The antennæ are composed of three segments. The proximal segment bears two plumose setæ.

The mouth-parts are of the usual Leuconid type. The maxillæ have two or three small setæ on the distal part of the inner edge.

The branchial system is reduced, the lobules being represented only by two small papillæ.

The first legs extend beyond the pseudorostrum by little more than the length of their last segment. The basis is little shorter than the remaining segments together, and the dactylus is nearly as long as the propodus. The exopod is shorter than the basis.

The second legs have the ischium distinct and the dactylus longer than the carpus.

The uropods have the peduncle a little longer than the last somite and about $3\frac{1}{2}$ times as long as thick, with one or two minute setæ on its inner edge. The endopod is about $1\frac{1}{4}$ times as long as the peduncle, somewhat indistinctly divided into two subequal segments, with about 12 spines on its inner edge and two unequal terminal spines. The exopod is longer than the endopod, with a slender terminal spine and a series of setæ on its inner edge.

Description of adult Male.—Total length 2·4 mm.

Teeth of dorsal crest of carapace in some specimens only a little less marked than in the female, in others almost obsolete. Pseudorostrum horizontal, truncated, about one-sixth of total length of carapace. No antennal notch or tooth, the antero-lateral corner rounded off, with a few obscure serrations. Only two oblique ridges on the side of the carapace, corresponding to the two posterior ridges of the female.

The antennules have the second and third segments of the peduncle shorter than in the female, and together shorter than the first segment. The flagella are similar to those of the female.

The antennæ have the penultimate segment of the peduncle more than one-half as long as the succeeding segment. The flagellum is very short, not more than twice as long as the peduncle, and not extending back beyond the first free thoracic somite in the natural position.

Exopods are present on all except the last pair of legs.

Only the first abdominal segment has appendages and these are of very small size. The peduncle is twice as long as broad and bears two minute unjointed rami. Each ramus has a single long plumose seta, and the outer bears in addition one or two short simple setæ.

The uropods hardly differ from those of the female, having only a few additional small setæ on the inner edge of the peduncle.

Occurrence.—"Lyttleton Harbour, 5/97, 1–5 fathoms, H. Suter"; "Akaroa Harbour, 8/97, 6 fathoms, H. Suter." Copenhagen Museum. Co-types in British Museum.

Hemileucon, gen. nov.

Differing from *Leucon* and *Paraleucon* in having no pleopods in the male sex.

Type species *H. uniplicatus*, sp. n.

Hemileucon uniplicatus, sp. n. (Plate IX. figs. 21–25.)

Description of adult Female.—Total length 2·6 mm.

Carapace about one-fourth of total length, its vertical height a little more than two-thirds of the length. The dorsal crest is slightly arched, its anterior half serrate. Pseudorostrum straight, slightly upturned, obliquely truncate; the length of its upper edge is less than one-fourth of the total length of the carapace. The antennal notch is well marked, defined below by a triangular tooth. The antero-lateral margin above the notch bears three or four serrations, and the front part of the lower margin is serrated. The side of the carapace is marked by a single horizontal ridge above the middle of its height, curving upwards posteriorly to join the hind margin, and terminating anteriorly below the end of the frontal fissure.

Antennules with the outer flagellum of three segments, the inner of one, equalling the first segment of the outer.

The legs, so far as they are visible without dissection, present no marked differences from those of *Paraleucon.*

The uropods have the peduncle a little longer than the terminal somite and three times as long as thick. The rami are subequal and $1\frac{1}{2}$ times as long as the peduncle. The endopod is distinctly segmented, the proximal $1\frac{1}{2}$ times as long as the distal segment. The terminal spine is not much longer than the distal spine of the inner edge. The exopod has several unequal setæ at and near the tip.

Description of adult Male.—Total length 2·35 mm.

Dorsal edge of carapace slightly arched, with only some faint traces of serration anteriorly. Pseudorostrum horizontal, truncated, less than one-fifth of total length of carapace. No antennal notch or tooth, the antero-lateral corner rounded off, the antero-lateral edge serrated from the base of the pseudorostrum to the lower edge. The side of the carapace bears a horizontal ridge similar to that of the female.

The antennæ have a very short flagellum and hardly reach back to the hind margin of the carapace in the natural position.

Exopods are present on all except the last pair of legs.

The uropods resemble those of the female.

Occurrence.—"Lyttleton Harbour, 5/97, 1–5 fathoms, H. Suter"; "Akaroa Harbour, 8/97, 6 fathoms, H. Suter." Copenhagen Museum.

HEMILEUCON COMES, sp. n. (Plate IX. figs. 26–32.)

Description of adult Female.—Total length 2·8 mm.

Carapace less than one-fourth of total length, its vertical height less than two-thirds of its length. Dorsal crest very slightly arched, irregularly serrate anteriorly, with a depression near the posterior end. Pseudorostrum straight, directed obliquely upwards, sharply pointed. The length of its upper edge is about one-third of the total length of the carapace. Antennal notch rather widely open, defined by a triangular tooth, the lower edge of which is obscurely serrated. The side of the carapace bears two oblique ridges similar in position to, though less strongly marked than the two anterior ridges of *Paraleucon.*

Abdomen hardly longer than the cephalothoracic region.

Antennules as in *H. uniplicatus.*

The first legs are imperfect in the specimens examined. The second legs have the ischium distinct. The dactylus is equal to the merus and carpus together.

The uropods have the peduncle longer than the last somite and about $3\frac{1}{2}$ times as long as thick. The endopod is longer than the peduncle and shorter than the exopod, and is distinctly divided into two segments, the proximal less than $1\frac{1}{2}$ times as long as the distal. There are about nine spines on the inner edge, increasing in length towards the slender terminal spine. The exopod has two unequal terminal setæ and series of setæ on the inner and outer edges.

Description of adult Male.—Total length 2·7 mm.

Dorsal edge of carapace slightly arched, smooth. Pseudorostrum horizontal, truncated, about one-sixth of total length of carapace. No antennal tooth or notch, antero-lateral corner rounded, no serrations on antero-lateral or lower edges. The side of the carapace bears two oblique ridges similar to, but fainter than, those on the carapace of the female.

The antennæ have the flagellum short, reaching to about the second free thoracic somite in the natural position.

Exopods are present on all except the last pair of legs.

The uropods resemble those of the female.

Occurrence.—"Lyttleton Harbour, 5/97, 1–5 fathoms, H. Suter." Copenhagen Museum.

PLATE I.

PLATE I.

Fig. 1.	*Bodotria sublevis* (p. 3).	Female.	Anterior part of body.	
2.	,, ,,	,,	First leg.	
3.	,, ,,	,,	Last somite and uropod.	
4.	,, *similis* (p. 4).	Female.		
5.	,, ,,	Male.		
6.	,, ,,	Female.	Carapace.	
7.	,, ,,	,,	First leg.	
8.	,, ,,	,,	Last somite and uropod.	
9.	,, ,,	Male.	Last somite and uropod.	
10.	,, *siamensis* (p. 5).	Female.		
11.	,, ,,	Male.		
12.	,, ,,	Female.	Carapace.	
13.	,, ,,	,,	First leg.	
14.	,, ,,	,,	Last somite and uropod.	
15.	,, ,,	Male.	Last somite and uropod.	
16.	,, *parva* (p. 5).	Female.	Carapace.	
17.	,, ,,	,,	First leg.	
18.	,, ,,	,,	Last somite and uropod.	

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1 - 3, BODOTRIA SUBLÆVIS. 4 - 9, B. SIMILIS. 10 - 15, B. SIAMENSIS. 16 - 18, B. PARVA.

PLATE II.

PLATE II.

Fig. 1.	*Cyclaspis elegans* (p. 9).	Female. From the side.
2.	,, ,,	Male. From the side.
3.	,, ,,	Female. From above.
4.	,, ,,	Male. From above.
5.	,, ,,	Young, before development of last pair of legs.
6.	,, ,,	Young male with developing pleopods.
7.	,, ,,	Female. Anterior part of head, from above.
8.	,, ,,	,, Antennule and antenna.
9.	,, ,,	,, Antenna, another view.
10.	,, ,,	Male. Antennule.
11.	,, ,,	,, Antenna.
12.	,, ,,	Female. Lower lip.—12 *a*. Tip of one of the lobes, further enlarged. 12 *b*. One of the spathulate spines.
13.	,, ,,	,, Maxillula.
14.	,, ,,	,, First maxilliped with branchial apparatus.—14 *a*. Endopod of same, further enlarged.
15.	,, ,,	,, Second maxilliped.
16.	,, ,,	,, Third maxilliped.
17.	,, ,,	,, First leg.
18.	,, ,,	,, Second leg.
19.	,, ,,	,, Third leg.
20.	,, ,,	,, Fourth leg.
21.	,, ,,	,, Fifth leg.
22.	,, ,,	Male. Pleopod.
23.	,, ,,	Female. Last somite and uropods.
24.	,, ,,	Male. Last somite and uropods.

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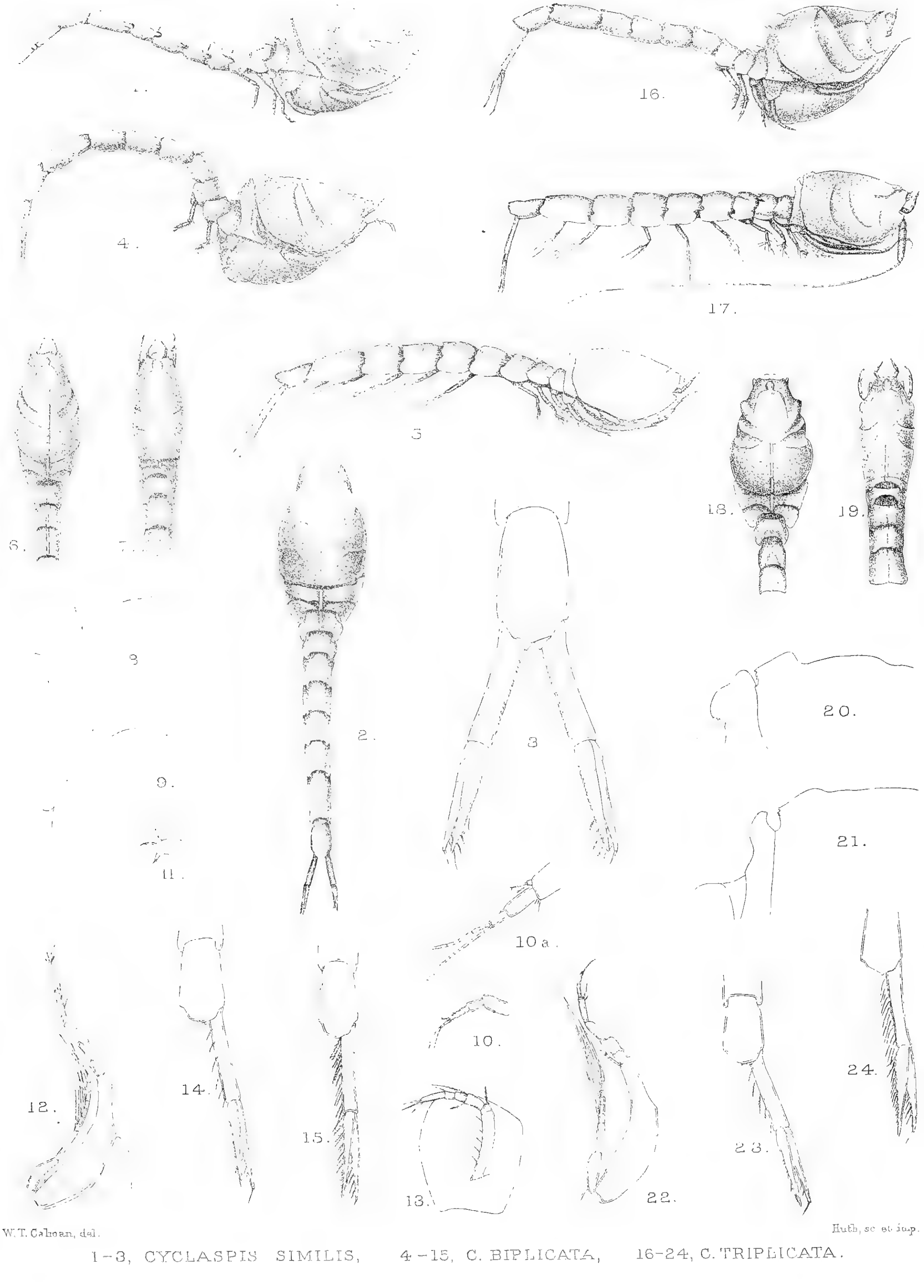
1–24 CYCLASPIS ELEGANS

PLATE III.

PLATE III.

Fig. 1.	*Cyclaspis*	*similis* (p. 12).	Female. From the side.
2.	,,	,,	,, From above.
3.	,,	,,	,, Last somite and uropods.
4.	,,	*biplicata* (p. 17).	Female. From the side.
5.	,,	,,	Male. From the side.
6.	,,	,,	Female. Anterior part of body, from above.
7.	,,	,,	Male. Anterior part of body, from above.
8.	,,	,,	Female. Dorsal outline of first free somite.
9.	,,	,,	Male. Dorsal outline of first free somite.
10.	,,	,,	Female. Antennule.—10*a*. Distal portion further enlarged.
11.	,,	,,	,, Antenna.
12.	,,	,,	,, First leg.
13.	,,	,,	,, Second leg.
14.	,,	,,	,, Last somite and uropod.
15.	,,	,,	Male. Last somite and uropod.
16.	,,	*triplicata* (p. 19).	Female. From the side.
17.	,,	,,	Male. From the side.
18.	,,	,,	Female. Anterior part of body, from above.
19.	,,	,,	Male. Anterior part of body, from above.
20.	,,	,,	Female. Dorsal outline of first free somite.
21.	,,	,,	Male. Dorsal outline of first free somite.
22.	,,	,,	Female. First leg.
23.	,,	,,	,, Last somite and uropod.
24.	,,	,,	Male. Last somite and uropod.



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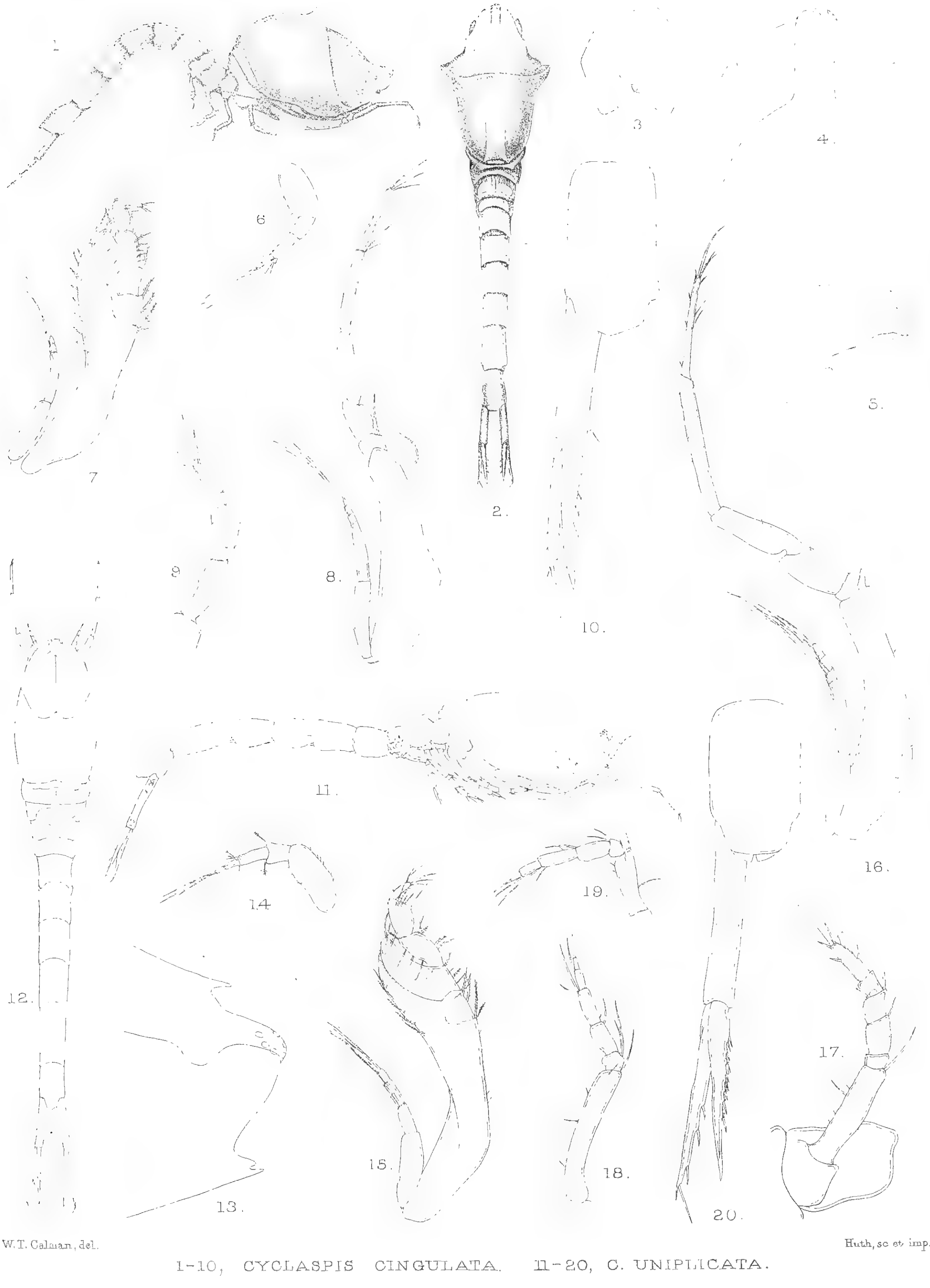
1–3, CYCLASPIS SIMILIS, 4–15, C. BIPLICATA, 16–24, C. TRIPLICATA.

PLATE IV.

PLATE IV.

Fig. 1.	*Cyclaspis cingulata* (p. 15).	Female.	From the side.
2.	,, ,,	,,	From above.
3.	,, ,,	,,	Outline of carapace, seen from in front.
4.	,, ,,	,,	Anterior part of head, from above.
5.	,, ,,	,,	Anterior part of head, from the side.
6.	,, ,,	,,	Antennule.
7.	,, ,,	,,	Third maxilliped.
8.	,, ,,	,,	First leg.
9.	,, ,,	,,	Second leg.
10.	,, ,,	,,	Last somite and uropod.
11.	,, *uniplicata* (p. 13).	Female.	From the side.
12.	,, ,,	,,	From above.
13.	,, ,,	,,	Anterior part of head, from the side.
14.	,, ,,	,,	Antennule.
15.	,, ,,	,,	Third maxilliped.
16.	,, ,,	,,	First leg.
17.	,, ,,	,,	Second leg.
18.	,, ,,	,,	Third leg.
19.	,, ,,	,,	Fifth leg.
20.	,, ,,	,,	Last somite and uropod.



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1–10, CYCLASPIS CINGULATA. 11–20, C. UNIPLICATA.

PLATE V.

PLATE V.

Fig. 1. *Cyclaspis longipes* (p. 7). Female. From the side.
2. ,, ,, Male. From the side.
3. ,, ,, Female. First leg.
4. ,, ,, ,, Last somite and uropod.
5. ,, ,, Male. Last somite and uropod.
6. ,, *levis* (p. 8). Female. From the side.
7. ,, ,, ,, First leg.
8. ,, ,, ,, Last somite and uropod.
9. ,, *unicornis* (p. 14). Female. From the side.
10. ,, ,, ,, First leg.
11. ,, ,, ,, Last somite and uropod
12. ,, *thomsoni* (p. 16). Female. From the side.
13. ,, ,, Male. From the side.
14. ,, ,, Female. First leg.
15. ,, ,, ,, Last somite and uropod.
16. ,, ,, Male. Last somite and uropod.

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1-5, CYCLASPIS LONGIPES. 6-8, C. LEVIS. 9-11, C. UNICORNIS.
12-16, C. THOMSONI.

PLATE VI.

PLATE VI.

Fig. 1.	*Eocuma*	*longicornis* (p. 20).	Male.	From the side.
2.	,,	,,	,,	From above.
3.	,,	,,	,,	Antennule.
4.	,,	,,	,,	First leg.
5.	,,	,,	,,	Second leg.
6.	,,	,,	,,	Last somite and uropod.
7.	,,	*lata* (p. 22).	Female.	From the side.
8.	,,	,,	,,	From above.
9.	,,	,,	,,	Minute texture of carapace, much enlarged.
10.	,,	,,	,,	Antennule and antennæ.
11.	,,	,,	,,	First leg.
12.	,,	,,	,,	Last somite and uropod.
13.	,,	*stellifera* (p. 23).	Female.	From the side.
14.	,,	,,	,,	From above.
15.	,,	,,	,,	Minute texture of carapace, much enlarged.
16.	,,	,,	,,	First leg.
17.	,,	,,	,,	Last somite and uropod.
18.	,,	*producta* (p. 24).	Female.	From the side.
19.	,,	,,	,,	From above.
20.	,,	,,	,,	Last somite and uropod

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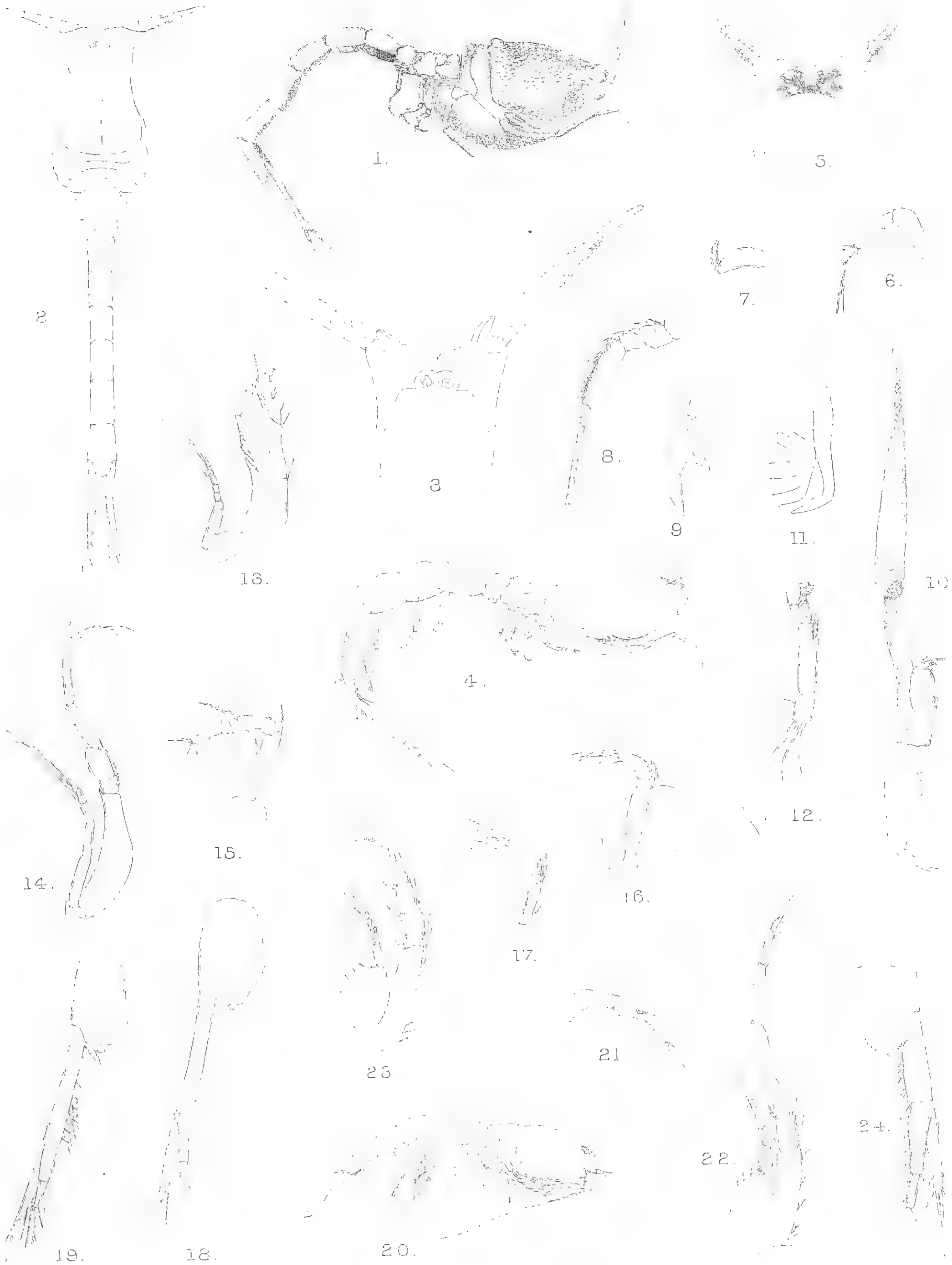
1–6, EOCUMA LONGICORNIS. 7–12, E. LATA. 13–17, E. STELLIFERA. 18–20, E. PRODUCTA.

PLATE VII.

PLATE VII.

Fig. 1.	*Zygosiphon mortenseni* (p. 25).	Female.	From the side.
2.	,, ,,	,,	From above.
3.	,, ,,	,,	Anterior part of head, from above.
4.	,, ,,	Male.	From the side.
5.	,, ,,	,,	Anterior part of head, from above.
6.	,, ,,	Female.	Antennule.
7.	,, ,,	,,	Antenna.
8.	,, ,,	Male.	Antenna.
9.	,, ,,	Female.	Mandible.
10.	,, ,,	,,	First maxilliped, with branchial apparatus.
11.	,, ,,	Male.	Posterior part of branchial apparatus.
12.	,, ,,	Female.	Second maxilliped.
13.	,, ,,	,,	Third maxilliped.
14.	,, ,,	,,	First leg.
15.	,, ,,	,,	Second leg.
17.	,, ,,	,,	Third leg.
16.	,, ,,	,,	Fifth leg.
18.	,, ,,	,,	Last somite and uropod.
19.	,, ,,	Male.	Last somite and uropod.
20.	*Vauntompsonia arabica* (p. 29).	Male.	From the side.
21.	,, ,,	,,	Antennule.
22.	,, ,,	,,	First leg.
23.	,, ,,	,,	Second leg.
24.	,, ,,	,,	Last somite and uropod.



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1 - 19, ZYGOSIPHON MORTENSENI. 20 - 24, VAUNTOMPSONIA ARABICA.

PLATE VIII.

PLATE VIII.

Fig. 1.	*Leucon* (?) *heterostylis* (p. 32).	Female.	From the side.
2.	,, ,,	,,	Carapace, further enlarged.
3.	,, ,,	,,	Antennule.
4.	,, ,,	,,	Second leg.—4 *a*. Middle part of same from inner side to show reduced ischium.
5.	,, ,,	,,	Last somite and uropod.
6.	*Eudorellopsis resimus* (p. 33).	Female.	From the side.
7.	,, ,,	,,	Carapace and antennule, further enlarged.
8.	,, ,,	,,	First leg.
9.	,, ,,	,,	Second leg.
10.	,, ,,	,,	Last somite.
11.	*Heteroleucon akaroënsis* (p. 34).	Female.	From the side.
12.	,, ,,	,,	Carapace.
13.	,, ,,	,,	Antennule.
14.	,, ,,	,,	Antenna.
15.	,, ,,	,,	Mandible.
16.	,, ,,	,,	Maxillula.
17.	,, ,,	,,	First maxilliped with branchial apparatus.
18.	,, ,,	,,	Third maxilliped.
19.	,, ,,	,,	First leg.
20.	,, ,,	,,	Second leg.
21.	,, ,,	,,	Last somite and uropod.
22.	,, ,,	Male.	From the side.
23.	,, ,,	,,	Carapace, antennule, and antenna.

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1 – 5, LEUCON (?) HETEROSTYLIS. 6 – 10, EUDORELLOPSIS RESIMUS.
11 – 23, HETEROLEUCON AKAROENSIS.

PLATE IX.

PLATE IX.

Fig. 1. *Paraleucon suteri* (p. 36). Female. From the side.
2. ,, ,, ,, Carapace, further enlarged.
3. ,, ,, ,, Antennule.
4. ,, ,, ,, Antenna.
5. ,, ,, ,, Mandible of right side and part of that of left side.
6. ,, ,, ,, Maxillula.
7. ,, ,, ,, Maxilla.
8. ,, ,, ,, First maxilliped with branchial apparatus.
9. ,, ,, ,, First maxilliped, further enlarged.
10. ,, ,, ,, Third maxilliped.
11. ,, ,, ,, First leg.
12. ,, ,, ,, Second leg.
13. ,, ,, ,, Fourth leg.
14. ,, ,, ,, Last somite and uropod.
15. ,, ,, Male. From the side.
16. ,, ,, ,, Carapace, further enlarged.
17. ,, ,, ,, Antennule.
18. ,, ,, ,, Antenna.
19. ,, ,, ,, Pleopod.
20. ,, ,, ,, Last somite and uropod.
21. *Hemileucon uniplicatus* (p. 37). Female. From the side.
22. ,, ,, ,, Carapace with antennule, further enlarged, showing outline of mandible.
23. ,, ,, ,, Last somite and uropod.
24. ,, ,, Male. From the side.
25. ,, ,, ,, Carapace with antennule and antenna, further enlarged.
26. ,, *comes* (p. 38). Female. From the side.
27. ,, ,, ,, Carapace, further enlarged.
28. ,, ,, ,, Antennule.
29. ,, ,, ,, Second leg.
30. ,, ,, ,, Last somite and uropod.
31. ,, ,, Male. From the side.
32. ,, ,, ,, Carapace, further enlarged.

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Huth, sc. et imp.

1–20. PARALEUCON SUTERI. 21–25, HEMILEUCON UNIPLICATUS. 26–32. H. COMES.

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August, 1907.

P. CHALMERS MITCHELL,
Secretary.

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Continued on page 3 of Wrapper.

II. *On recently discovered Subfossil Primates from Madagascar.* *By* HERBERT F. STANDING, *D.Sc.* (*Leeds*), *M.Sc.* (*Vict.*).—*With an Appendix: On the Form of the Brain in the Extinct Lemurs of Madagascar, with some Remarks on the Affinities of the* Indrisinæ. *By* G. ELLIOT SMITH, *M.A.*, *M.D.*, *F.R.S.*, *Professor of Anatomy, School of Medicine, Cairo.*

Received and read March 19, 1907.

[PLATES X.–XXVIII. and Text-figures 1–52.]

INTRODUCTION.

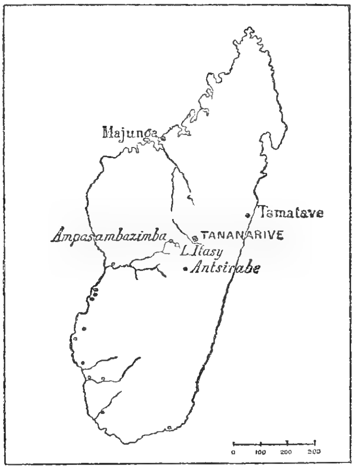
THE existence in Madagascar of a considerable subfossil fauna has long been known to zoologists, but it is only within quite recent years that the extent and scientific interest of these remains have been recognised. In his valuable thesis on fossil Lemuroidea, published in 1906, Dr. G. Grandidier has given a summary of the results of the work of various travellers and investigators in this field during the last few years. I need not here do more than refer to the memoirs of Forsyth Major, Andrews, Milne-Edwards, Filhol, Grandidier, Lorenz, Guldberg, Burckhardt, and others, who have done so much to throw light on the nature and affinities of the numerous mammalian and other vertebrate remains which have been brought to Europe during recent years.

The various localities where these remains have been found are situated chiefly on the south-west and south coasts of the island, and include both lacustrine and cave-deposits. In the volcanic regions of the central plateau two districts have been discovered and partially explored which have already yielded very valuable additions to our knowledge of the subfossil fauna of Madagascar.

The more recently discovered of these localities is situated at Ampasambazimbas about 100 kilometres to the west of the capital, in the district of Miarinarivo (text-fig. 1). The *Académie Malgache*, a scientific society the headquarters of which are in Tananarive, has undertaken the systematic study of the numerous remains exhumed at this place; and at the request of this Society I have had occasion during the last four years to publish in the *Bulletin* of the *Académie* several preliminary notices referring to the various subfamilies of Lemuroids represented among these remains. The richness and variety of the material already discovered and the interesting nature of the conclusions which it appears to me may legitimately be drawn from a detailed study of these recently extinct Lemuroids, seem to warrant a more systematic treatment than it was possible to give in the brief notices above referred to.

In a preliminary section the nature and probable origin of the deposits at Ampasambazimba will be briefly discussed. These deposits are especially rich in mammalian remains. In the comparatively small area already explored some 60 skulls of Lemuroids, mostly in an excellent state of preservation, and representing

Text-fig. 1.



Sketch-Map of Madagascar showing position of Ampasambazimba and other fossil deposits.

several new species and one new genus, have been found. In addition to these Primate remains at least 200 skeletons of Hippopotami of all ages have been exhumed, besides numerous remains of *Cryptoprocta*, *Centetes*, and other Insectivora.

Along with these vestiges of an extensive subfossil mammalian fauna large numbers of bones of *Æpyornis*, Chelonians, Crocodiles, Lizards, &c. have been found. It is my intention, however, at present to confine myself to a description and discussion of the fine series of Lemuroid remains which have been brought to light at Ampasambazimba. These not only form a most valuable contribution to our knowledge of the strange extinct fauna of Madagascar, but also throw light on the origin and affinities of the existing Primates of that interesting island.

After discussing the character and probable origin of the fossiliferous beds at Ampasambazimba my aims in the present memoir will be:—

1. To give a detailed description of the various new species or genera of Lemuroids, drawing special attention to such characters as tend to explain the affinities of the different forms.

2. To discuss the origin and relationships of existing species in the light of these subfossil remains.
3. By a comparative survey to trace the bearing of recent discoveries on the position of the Lemuroids and their relations to the higher Primates, an attempt being made to throw some light on the course of development of the Primates in general, and incidentally to distinguish between such so-called lemuroid characters as are due to degeneration or specialisation on the one hand and such as may be considered as belonging to a common ancestral Primate stock on the other.

I wish in this place to express my thanks to the various members of the staff of the British Museum at South Kensington who have generously given me every facility for the comparative study without which the preparation of this memoir would have been impossible. I am especially indebted to Dr. Smith Woodward and Dr. Andrews, of the Geological Department, who have, with unfailing courtesy, given me every assistance in their power.

In the course of this essay, I have, I trust, made ample acknowledgment of my indebtedness to Dr. Forsyth Major, whose views on the affinities of the Lemurs are in almost every instance confirmed by a study of the ampler material now at my command.

I must not omit to record also my hearty thanks to my former professor, Dr. L. C. Miall, of the University of Leeds, for much valuable help during the preparation of this memoir, and to Dr. Elliot Smith of Cairo, whose special knowledge of the comparative morphology of the Primate brain has been brought to bear on the elucidation of the problems raised by the discovery of these interesting remains. It should, however, be understood that the responsibility for the particular views here advanced is entirely my own.

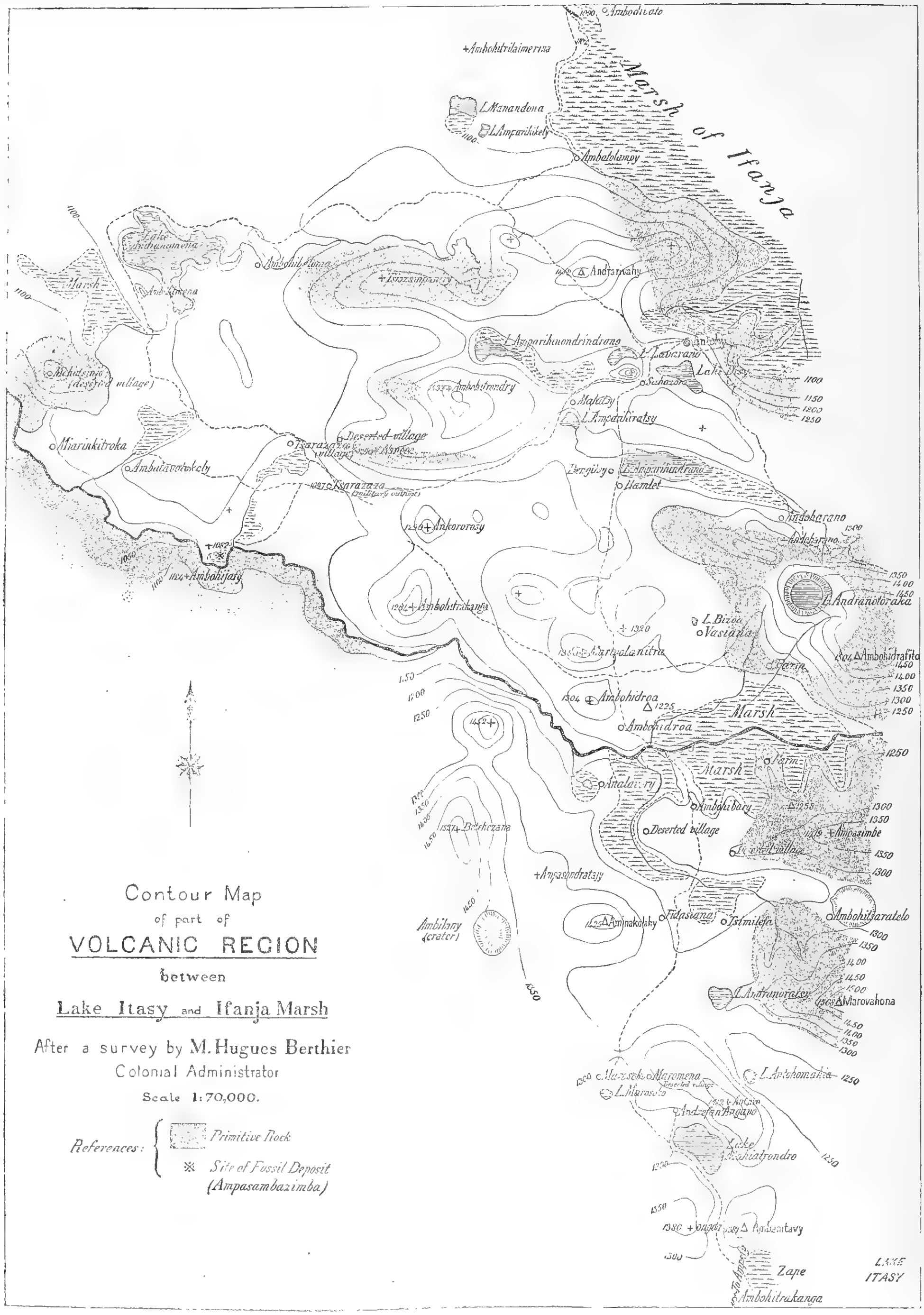
In conclusion, I cannot refrain from alluding to the sad loss which the cause of scientific research in Madagascar has sustained in the death of my late lamented friend and colleague Mons. A. Jully, to whose initiative as President of the *Académie Malgache* the work of exploration, which has resulted in such valuable additions to our knowledge of the extinct fauna of Madagascar, was largely due.

THE FOSSILIFEROUS DEPOSITS AT AMPASAMBAZIMBA.

Ampasambazimba ("The Vazimba's Tomb") takes its name from a reputed tomb of one of the aboriginal inhabitants of the country which is situated on the edge of the fossiliferous marsh. It lies near the western side of the area of volcanic disturbance which runs north and south for several days' journey to the west of the province of Imerina.

This area represents a region of more recent disturbance than the mass of the

Text-fig. 2.


Contour Map
of part of
VOLCANIC REGION
between
Lake Itasy and Ifanja Marsh
After a survey by M. Hugues Berthier
Colonial Administrator
Scale 1:70,000.
References:
Primitive Rock
Site of Fossil Deposit
(Ampasambazimba)
Marsh of Ifanja
L. Manandona
Ambatolampy
Andranoтoraka
Ambohidrafito
Ambohidroa
Marsh
Deserted village
Ambohibary
Ampasimbe
Ambohitsaratelo
Marovahona
Ambilany
(crater)
Fidasiana
Ambohijafy
Miarinkitroka
Ankororosy
Vasiana
Lake Itasy
Zape
Ambohitrakanga

Ankaratra Mountains. Volcanic cones are thickly scattered over a large part of this district, and at many points extensive lava-streams of varying age are plainly visible.

The fossiliferous marsh occurs in the course of the River Mazy, an affluent of the Sakay, the waters of which discharge themselves into the Mozambique Channel. The Mazy, after traversing a region of primitive rock in a westerly direction, encounters several streams of lava which have entirely deflected it from its ancient course. There is evidence of the recent drying up of extensive lakes in the neighbourhood, of which fact the traditions of the natives give confirmation.

A reference to the accompanying contour map (text-fig. 2) showing the results of a careful survey of the region by M. Berthier, Administrator of the District, and which by the courtesy of the late M. Jully I am able here to reproduce, will show that above the fossiliferous marsh the Mazy has cut its course for several kilometres through an ancient lava-flow and that on encountering the primitive rock it has followed the line of division between this formation and the volcanic output.

The fossiliferous marsh itself is roughly semicircular in form. It is bounded on its semicircular contour by the River Mazy, the bed of which now lies some five metres below the surface of the marsh. On its other sides it is limited by a stream of lava, the surface of which shows it to be of much more recent date than that traversed by the river in its higher reaches (text-fig. 3).

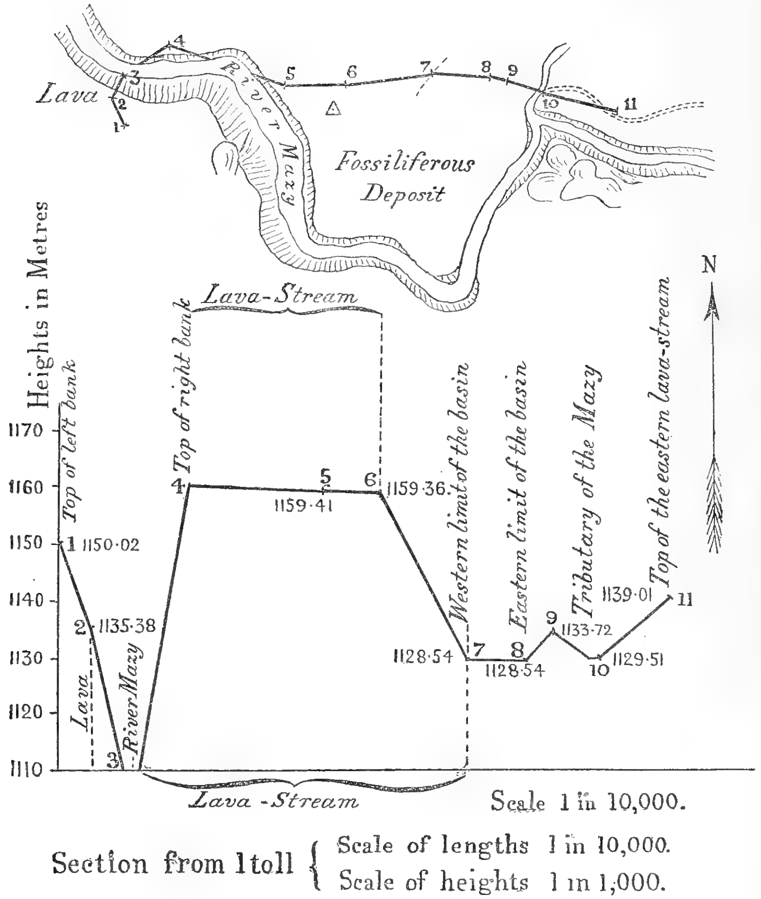
A calcareous deposit several metres thick and of great hardness separates the marsh from the river, and it is no doubt to the presence of this broad bank of limestone that the preservation of the fossiliferous deposits is due.

The marsh when trenched presents considerable variety in the sections exposed. Over large areas there are deposits of travertin in varying thickness. This in many parts forms an unbroken sheet which greatly impedes the work of exploration; here and there this sheet is replaced by detached nodules, and over considerable areas the lime-deposits are absent. Mineral springs are abundant, but all are now cold. They are of varying mineral constituents, some being strongly impregnated with iron and many highly charged with carbonic acid. From these springs the deposit of lime is still forming.

On making a section through a part of the marsh where the layers of limestone are discontinuous, various strata are successively encountered.

To a depth of about 1 metre below the present surface the deposits consist of recent vegetable remains succeeded by a fine black humus which rapidly turns to mud on admixture with water. This is superposed on a stratum of forest débris, consisting of leaves, twigs, seeds, and fruits of numerous species. Below this again a layer of larger branches and tree-trunks is frequently encountered. These vegetable remains are in a wonderful state of preservation, the leaves often retaining their green colour. The bones begin to appear in general with this layer of wood, though they are occasionally met with nearer the surface.

Text-fig. 3.



Plan of Fossil deposit at Ampasambazimba showing altitudes along a line crossing the River Mazy (1 to 4), the N.W. lava-stream (4 to 7), the northern edge of fossil marsh (7 and 8), the eastern tongue of lava (8 to 10), the tributary used for channel through diggings (10), and the edge of extensive ancient lava-flow (11).—From survey made for present memoir by Mons. Hugues Berthier, Administrator of the District.

In several places the bed of the marsh has been uncovered. It is found to consist of a compact layer of volcanic pebbles cemented together by mineral deposits and frequently presenting a metallic sheen. These pebbles apparently form a nearly horizontal floor about 3 metres below the present surface.

Primate remains are found at all depths; the bones of Hippopotami, Crocodiles, and Chelonians occur chiefly, though not exclusively, in the lower strata.

Two theories have been proposed to account for the origin of this rich deposit of fossils at Ampasambazimba. The first is that put forward by Messrs. Baron & Mounèyres, who visited the site soon after its discovery. They say in their report:—

"A notre avis, les ossements ainsi rencontrés et qui sont relativement condensés dans un petit espace, sont les restes d'animaux qui se sont rendus en ce point pendant un long espace de temps et qui y sont morts, soit de mort naturelle, soit de suite de maladies ou de luttes, le cas de semblable concentration est fréquent aux points où sourdent les eaux minérales."

It is quite possible that this explanation may account for the presence of some of the remains exhumed at Ampasambazimba. The thickness of the lime-deposits would show that the mineral springs are of ancient date, but there are strong objections to the belief that this theory supplies a sufficient explanation. In the first place, the very large numbers of aquatic and amphibious animals—Hippopotami, Crocodiles, and Chelonians—would seem to lead to the inference that a considerable sheet of water formerly existed at this point. A further objection arises from the consideration of the state of the fossils themselves. In the case of the Lemuroid remains it has not been found possible to reconstitute a single complete skeleton, the bones being scattered without any apparent order. Thus, for example, a large number of humeri and several radii of *Megaladapis* have been discovered, but not a single femur. Considerable numbers of femurs and tibio-tarsi of various species of *Æpyornis* have been found, but comparatively few vertebræ, and only one imperfect skull. In describing the method found necessary in exhuming the bones in the alluvial deposit at Lamboharana on the south-west coast Dr. Grandidier says:—"The bones are not at a great depth, never more than two metres; they are encased in a compact humus, which during the work is rapidly transformed into mud on account of the water which immediately invades the diggings as the operations are continued. This is, indeed, the chief obstacle to the methodical carrying out of the search, and which, both in the western region and in the centre of the island, prevents the finding of complete skeletons, for one is obliged to feel for the submerged bones either with a spade or with the hands or feet, according to the depth at which they are situated under the water, and to draw them out one by one."

If the above description were applicable to the method employed at Ampasambazimba the argument as to the scattered and incomplete character of the remains exhumed would not have much weight; but, as I shall presently describe, it has been possible here to employ a much more perfect method, by which the contents of the marsh over a considerable area have been thoroughly explored, and had any perfect skeletons existed they must of necessity have come to light.

What, then, is the origin of this deposit which has yielded such valuable results in spite of the fragmentary nature of the remains? A careful study of the topography of the immediate neighbourhood has revealed the fact that the flow of lava which now bounds the marsh on the north and west sides must at the time of its output have completely blocked up the course of the River Mazy and formed a lake of considerable area. The lava-flow now rises above the present bed of the river to a height of 50 metres and forms abrupt cliffs overhanging the river and showing the usual broken columnar structure due to the erosive action of the river and prolonged weathering. But there are two interesting facts which show clearly that this lava-stream *once impinged on the primitive rock on the left bank of the river.* The first is that considerable masses of lava remain *in situ* embedded among the primitive rock high up above the present level of the stream (text-fig. 3, No. 2). The second fact is that there exists on the right bank of the river, at the point where it now first encounters the basaltic cliffs, a triangular section of what once has been a promontory of primitive rock continuous with the present cliffs on the *left* bank; thus showing not only that the river has been deflected from its course by the lava-flow, but that its original bed has been entirely obliterated and filled in by the stream of lava. Under these circumstances one is driven to the conclusion that a lake must have been temporarily formed and that the height of its surface must have been at least equal to that of the masses of lava mentioned above and probably considerably higher, since detached fragments of volcanic rock are found further up the hill-side. A tongue of lava at a lower level has also descended on the east side of the present area of the marsh.

Reference to the sketch-map (text-fig. 3) will show that the present course of the river turns abruptly south at the eastern edge of the marsh. As already stated, the stream is now far below the level of the floor of the alluvial deposits, but a broad bank of water-worn pebbles which at this point overlies the tongue of lava forming the eastern boundary of the marsh shows that formerly the river flowed at a much higher level, and must, in fact, have been some 25 feet above the then floor of the basin.

It is thus extremely probable that at least the lower layers of fossiliferous alluvium were deposited in this lake. The presence of large numbers of aquatic animals would thus be explained, and, conversely, some support is given to the presumption, arising from anatomical evidence to be adduced later, that some at least of the gigantic Lemuroids whose remains occur mingled with those of Hippopotami, Crocodiles, and Chelonians, were themselves aquatic. In the case of the *Æpyornis* and other land-animals, one may suppose that during the course of the lengthened period which must have elapsed ere the river wore down its exit sufficiently to drain the lake, numerous carcases of these animals were brought down by the annual floods, and finally settled down in the alluvial deposit forming on the floor of the lake. This view seems the more probable in that numerous remains of *Æpyornis* have been found actually embedded among the water-worn pebbles where the bank of shingle shelves down at this point to form the floor of the basin.

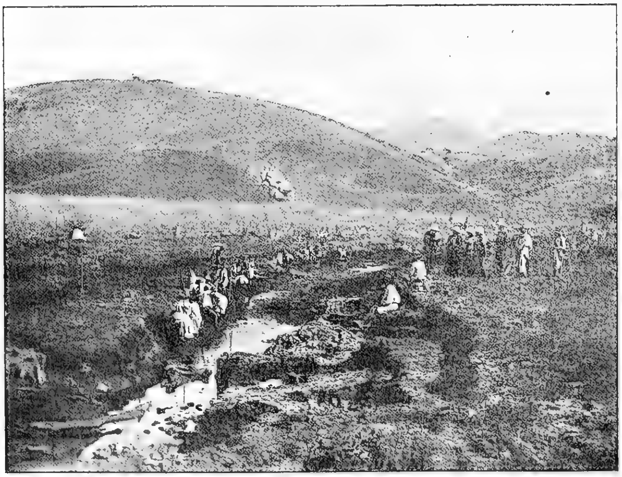
It will be seen on referring to the contour-map to what an extent volcanic action has taken place in the region drained by the Mazy in the higher reaches of its course. It is certain, not only that the country was formerly much more wooded than at present, but that large areas were covered by lakes which have since been drained. Judging by the recent appearance of some of the streams of lava and the very irregular character of the surface in this volcanic region, it is quite possible that considerable tracts of forest may have been actually devastated and the débris of the flora and fauna carried down and deposited in the lake at Ampasambazimba. A curious incidental confirmation of the belief that these animal remains were deposited in water is afforded by the fact that very many bones, notably the pelves of giant Chelonians and skulls of *Palæopropithecus*, show the imprints of Crocodiles' teeth. The photograph of a skull of *Palæopropithecus maximus* shown in Plate XII. fig. 1 will illustrate this fact.

It has been possible in the case of the fossils at Ampasambazimba to employ a method of excavation which has great advantages over that described above by Grandidier. It will be noticed on reference to the map that a small affluent joins the River Mazy at the point where the latter turns abruptly southwards before skirting the edge of the marsh. An ancient native watercourse indicated where a part of the waters of this streamlet had been led round the head of the marsh for the purpose of irrigating the rice-fields, traces of which may still be seen. By deepening and widening this watercourse and continuing it by a broad channel down to the edge of the marsh, it was found possible to conduct a considerable volume of water right through the fossil diggings. It was necessary at the same time to provide an outlet for this stream at the southern edge of the marsh. Here a formidable obstacle presented itself in the broad barrier of compact travertin which has already been referred to as separating the fossiliferous deposits from the present course of the river. By the help of native workmen and a considerable expenditure of dynamite, a channel some 40 metres long and about 2 metres deep was at length cut. It was now possible to expose a long vertical section of the marsh, and a line of workmen could be employed throughout the day working against the vertical wall thus formed; while each evening the earth thus carefully examined could be got rid of by sending it down the stream into the river below. By this method the smallest and most fragile articles can be obtained intact. In one instance, a small bird's egg was found unbroken at a considerable depth in the compact black earth. The percentage of the breakages of valuable specimens has thus been greatly reduced, and one can feel certain, with a company of trained workers, that nothing of importance will escape their scrutiny. The accompanying photographs (text-figs. 4–8) will sufficiently supplement the description here given of this method of excavation.

Text-fig. 4.

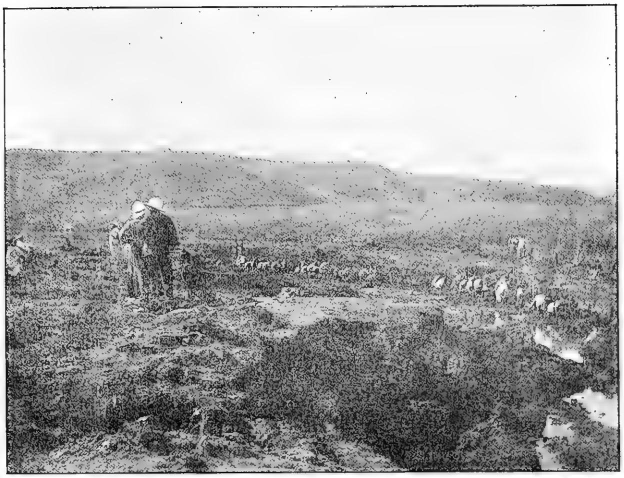
General view of fossil marsh, looking South-west. Gang of natives in fore-ground digging channel across the eastern tongue of lava. The River Mazy lies between the marsh and the line of hills of metamorphic rock.

Text-fig. 5.



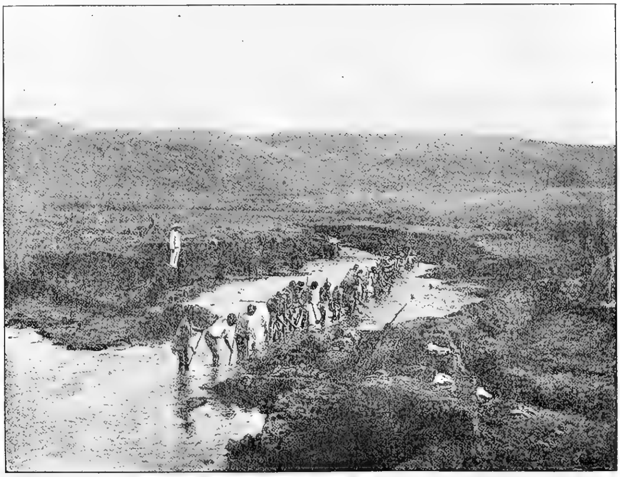
Nearer view of marsh, looking South, showing fossil diggings along its eastern edge. To the right is the untouched surface of the marsh.

Text-fig. 6.



View of fossil diggings, looking North.
In the distance is the main lava-stream; to right, the lower tongue forming the eastern boundary of marsh.

Text-fig. 7.



Method of getting rid of earth by deflecting stream through diggings at end of day.
Nearer view of lava-stream beyond the marsh.

Text-fig. 8.

Channel through barrier of travertin separating fossil deposits from river.

Turning, finally, to the question of the age of these deposits at Ampasambazimba, we find that the data for the solution of the problem, while fairly numerous, are not very precise. These data may be briefly enumerated as follows:—

(*a*) The age of the neighbouring lava-flow as judged by disintegration of surface;
(*b*) The depth of material worn through by the river in cutting its new channel;
(*c*) The depth of alluvial deposit in the marsh;
(*d*) The state of preservation of the fossils;
(*e*) The traces in the deposits of contemporary human occupation of the district;
(*f*) Traditions of the natives as to the former existence of animals now extinct.

The full discussion of these various points, while of much interest, would lead us beyond the limits of this paper. A brief reference to a few salient facts must suffice.

It is evident in the first place, from the facts already detailed, that the river, in order to reach its present level, must have cut through some 80 feet of material. Its course, however, now lies, as above explained, between the recent volcanic and the ancient primitive rock, and it is at the expense of both these formations that its new channel has been cut. To anyone who knows the effect of the annual tropical rains on the disintegrated granites and gneisses of the central region of Madagascar, the denudation of a depth of 80 or 100 feet in a comparatively small number of years is quite conceivable. Again, since, as above shown, the lake which formerly occupied the site of the present marsh received year by year the alluvium brought down by the floods during the rainy season, a deposit of several feet of earth and organic débris need not necessarily have occupied a very lengthened period. The wonderful state of preservation of many of the remains, both of plants and animals, would seem to suggest a comparatively recent origin; thus one Lemur's skull contained when found a white pulpy substance, evidently representing the brain of the animal. On the other hand, the well-known preservative action of the organic acids of the bog must be remembered.

Fragments of pottery, beads, and other traces of the occupation by man of the surrounding district occur in the upper strata. One small round piece of earthenware of foreign origin is especially interesting. I have submitted this to Mr. C. H. Read, of the British Museum, who reports that it is a coarse earthenware of Chinese manufacture. Its presence at this remote site in the interior of Madagascar must probably be attributed to intercourse with Arab traders. Dr. Forsyth Major in his memoir on *Megaladapis madagascariensis* has referred to the legends current among the natives relating to the former existence in the island of extinct animals of large size. That memories of the quite recent existence of the Hippopotamus exist in many localities is unquestionable, indeed the native name (*lalomena*) finds a frequent place in local traditions and folklore. There is also a reference to a creature called the *Tokan-dia* ("the one with a single footprint"), which may well have been the *Æpyornis*. Taking all these facts into consideration I should be inclined to fix the age of the uppermost of the Lemuroid remains (including a skull of *Palæopropithecus* and one of *Mesopropithecus* found about 90 cm. below the present surface of the marsh) as probably not more than five centuries. But evidently there is large scope for conjecture in the attempt to solve such a problem. One may at any rate from a biological point of view regard all these subfossil Malagasy Lemuroids as the contemporaries of extant species in other parts of the island.

Classification of Extant and recently Extinct Lemurs.

Families.	Subfamilies.	Genera.
Indrisidæ	*Archæolemurinæ*	*Archæolemur.*
		Hadropithecus.
	Indrisinæ	*Mesopropithecus.*
		Palæopropithecus
		Indris.
		Propithecus.
		Avahis.
	Chiromyinæ	Chiromys.
Lemuridæ	*Megaladapinæ*	*Megaladapis.*
	Lemurinæ	*Lemur.*
		Lepidolemur.
		Hapalemur.
	Galaginæ	Chirogaleus.
		Galago.
	Lorisinæ	Loris.
		Nycticebus.
		Perodicticus.
Tarsiidæ	Tarsiinæ	Tarsius.

Note.—The Genera &c. represented by subfossil forms are printed in Italics.

Family INDRISIDÆ.

Malagasy Primates recent or subfossil showing evidence of common descent from ape-like ancestors, their affinity being, however, disguised by the varying degrees to which the different subfamilies have become specialised in adaptation to various modes of life. The dentition in every case shows reduction from the "primitive" or "generalised" Primate formula (retained by the Cebidæ and many of the Lemuridæ), such reduction being carried furthest in *Chiromys*, and least apparent in the Archæolemurinæ. Outer pair of upper incisors when present smaller than inner. Lower first premolar generally caniniform.

Auditory bullæ generally present. Lacrymal fossa variable in position—within the orbit, on the orbital margin, or on the face.

There is frequent evidence of retrogressive change in brain-structure.

Note.—The reasons which appear to justify the creation of this new family will be made apparent in the detailed descriptions which follow, and more especially in the final Comparative Survey.

Subfamily INDRISINÆ.

Subfossil and recent Malagasy Indrisidæ, the pithecoid affinities of which are in most of the genera disguised by adaptive specialisation.

Brain-case generally depressed; subfossil forms showing marked constriction of postorbital frontal region. Nasal fossa large, with tendency in recent genera to elongation of muzzle and depression of facial angle, the latter characters being less marked in *Mesopropithecus*. Position of lacrymal fossa variable.

Dental formula of all genera: $\frac{\text{i. } 2:\text{ c. } 1:\text{ pm. } 2:\text{ m. } 3}{\text{i. } 2:\text{ c. } 0:\text{ pm. } 2:\text{ m. } 3}$. All show reduction of upper third molar. Long inclined mandibular symphysis. Mandible of subfossil forms massive. Auditory bullæ generally present and prominent.

Genus PALÆOPROPITHECUS (G. Grandidier).

Definition.—Subfossil Indrisinæ much specialised and probably adapted to an aquatic life. Brain-case depressed with postorbital constriction. Occiput vertical, lambdoidal crest frequently present. Orbits high and upwardly inclined with raised margins. Postorbital bar triangular with sharp inner edge. Premaxillæ send up strongly developed projections which are fused to the anterior margin of nasals. Zygomata high and arched. Auditory bullæ absent. Series of molars and premolars parallel. Mandible very massive with inclined symphysis. Lower incisors sub-equal, but little inclined, and not pectinate in disposition.

Dental formula: $\frac{\text{i. } 2:\text{ c. } 1:\text{ pm. } 2:\text{ m. } 3}{\text{i. } 2:\text{ c. } 0:\text{ pm. } 2:\text{ m. } 3}$.

PALÆOPROPITHECUS MAXIMUS (Standing). (Plates X.–XV.)

Until the discovery of the Lemuroid remains at Ampasambazimba nothing was known of the skull of *Palæopropithecus*. In this locality 13 almost perfect crania have been exhumed, besides numerous fragments. These, while showing considerable variations in size and proportions, must all be referred to one species, to which the name of *Palæopropithecus maximus* has been given. So far as it is possible to make a comparison with the species named by Dr. Grandidier, the animal found at Ampasambazimba appears to have been larger and much more massive. This will be evident on a comparison of the various numbers denoting the breadth of the jaw and length of the symphysis in the following table:—

TABLE 1.—Showing comparative dimensions of mandible of *Palæopropithecus ingens* and *P. maximus.*

	P. ingens.	*P. maximus.*
	mm.	mm.
From the condyle to the summit of the symphysis	130	166
Length of series of molars and premolars	76·5	88
From condyle to posterior edge of third molar	55	65
Length of symphysis	58	86
Width between second premolars and first molars	26	36
Width between anterior margins of first premolars	14	25
Width of series of incisors at base	13	23
Maximum length of first premolar	14	17·5
,, width ,, ,,	6	6·5
,, length of second premolar	15	17·4
,, width ,, ,,	7·5	8·8
,, length of first molar	16·8	17·6
,, width ,, ,,	9	11·5
,, length of second molar	16	16·8
,, width ,, ,,	8	10·7
,, length of third molar	13·5	14
,, width ,, ,,	8	9·4

Description of the Skull of Palæopropithecus maximus.

The skull of *Palæopropithecus* in its general features conforms to the type of the Indrisinæ, though curiously departing from that type in certain particulars. It is broad and flattened, with depressed brain-case and narrow postorbital frontal region. The facial portion is short, herein contrasting strongly with *Megaladapis.* The occiput is vertical; the zygomatic arcade high and widely curved away from the brain-case. The orbits are small and extraordinarily elevated in position and upwardly directed. The nasals at their anterior margins are turned upwards and form a suture with a curious shell-like upward prolongation of the premaxilla. The dentition resembles in general that of *Propithecus,* though in detail presenting many deviations from the type of the recent Indrisinæ. The entire absence of auditory bullæ is the most marked peculiarity to be observed in the base of the skull (see Plate X.).

On attempting to give detailed measurements of the skull one is impressed with the great variety both in absolute size and in the proportion of the various parts presented by different specimens. Among the earliest examples obtained at Ampasambazimba were two showing such differences in outline and proportions that I referred them to two distinct species. In view of the complete series of more than a dozen skulls eventually obtained, this distinction appears to be no longer tenable, and all the specimens are referred to the one species *P. maximus.* The average maximum length of the skull of *Palæopropithecus maximus*, measured from the lambdoidal crest to the alveolar margin of the incisors, is 198 mm. (max. 216, min. 181 *). The average bi-zygomatic breadth for six skulls where both arcades are complete measured 121 mm. (max. 135·5, min. 113). The ratio between the maximum breadth and maximum length expressed as a percentage index is 61. Similar measurements taken on a skull of *Indris* give the number 59·4. The maximum external breadth across the orbits in the case of *Palæopropithecus* is 98 mm., giving, when compared with the maximum length of the skull, an index of 49·5; similar measurements on *Indris* and *Propithecus* give indices of 61·5 and 63·6 respectively.

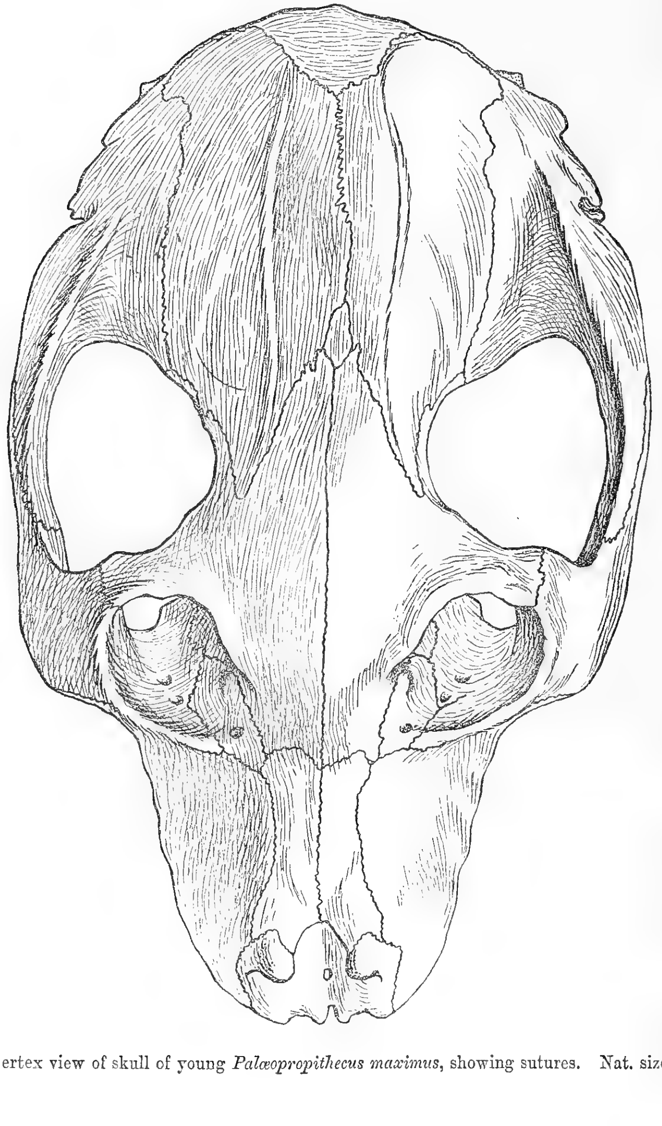
The form and proportions of the individual bones composing the brain-case conform in general to the condition observed in *Indris* and *Propithecus.*

Occipital Region.—The occiput is truncated and forms a plane at right angles to the long axis of the skull. The *foramen magnum* is, generally speaking, circular in outline, but varies much in size and shape, corresponding diameters showing a discrepancy of 5 or even 7 mm. in different skulls. The occipital condyles are broad and prominent, frequently in adult skulls projecting backwards beyond the lambdoidal crest (Plate X.). The paroccipital processes are extraordinarily developed, their free internal margins attaining in some cases a length of 20 mm. and extending downwards and backwards nearly as far as the condyle itself. In its basal portion this process follows along the margin of the occipito-temporal suture as a prominent ridge, in some instances reaching the lambdoidal crest. On its outer edge it is fused to the strongly developed mastoid process of the squamosal and also to the styloid process. The prominent convexity for the lodgment of the central lobe of the cerebellum, which is a marked feature of the occiput of the extant Indrisinæ, is absent in *Palæopropithecus*, this region of the skull-wall being much thickened and of porous texture. The lambdoidal ridge is prominent in all but quite young skulls, and in old individuals forms a sharp crest which descends along the mastoid process, an upper branch passing above the external auditory meatus to join the upper edge of the high zygomatic process of the squamosal. Where it is still possible to trace the lambdoidal suture, the supraoccipital is seen to enter to but a small extent into the roof of the cranium. In one young skull the supraoccipital occupies 18 per cent. of the distance from the lambdoidal crest to the root of the nasals (text-fig. 9), while in *Propithecus* more than 25 per cent. of this distance is covered by the supraoccipital.

Parietal Region.—The brain-case in the parietal region is narrow and depressed,

* When dimensions are given in the following description three numbers will generally be quoted, the first being the average for a series of several skulls; and following this in parentheses are the maximum and minimum measurements noticed in any individual.

Text-fig. 9.



Vertex view of skull of young *Palæopropithecus maximus*, showing sutures. Nat. size.

though approaching more nearly to the condition of recent Lemurs than is the case with *Megaladapis* (Plates XII. & XIII.). The upper lines of attachment of the temporal muscles form strongly marked ridges, occasionally uniting in old skulls to form a longer or shorter sagittal crest; but in the majority of cases the fusion of these ridges has only taken place for a short distance above the occiput, the two lines diverging at various angles, leaving a flattened space, wedge-shaped or fusiform, according to the direction taken by the lateral ridges before they widely separate to join the postorbital bar (Plate XIII.). The parietal suture becomes obliterated in old specimens, though the line between the frontals can be traced in almost every case. The squamosal extends up the wall of the brain-case to about the same relative height as in *Propithecus*, and the spheno-parietal and coronal sutures closely conform to the conditions observed in the extant genera, though the coronal suture has an acute wedge-shape form recalling that of some of the Cebidæ (e. g. *Pithecia rufiventer*) (text-fig. 9).

Frontal Region.—The postorbital region of the frontal resembles the corresponding part of the skull of *Megaladapis*, being very much constricted compared with the modern representatives of the subfamily. The average breadth in this region for 13 skulls was 36 mm. (max. 40·5, min. 28). This is about 18 per cent. of the maximum length of the skull, being only about half a similarly obtained index in the case of *Propithecus*, viz. 35·6.

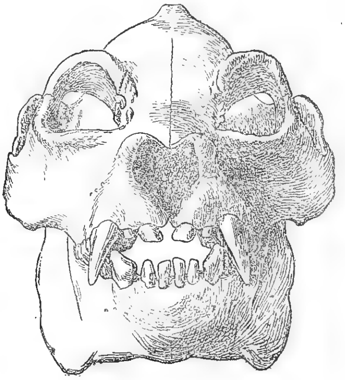
The frontal sinuses are voluminous and have encroached on the cranial cavity in a manner analogous to that observed in *Megaladapis*. There is indeed a similar though less pronounced atrophy of the temporal lobes of the brain with a partial obliteration of the lumen between the cerebral and olfactory fossæ*. The median line of the frontal behind and between the orbits is convex, though the degree of convexity varies greatly in different specimens. There is also a slight convexity in a transverse direction.

The Orbital Region.—The size, position, and direction of the orbits have already been referred to as differentiating *Palæopropithecus* from living Indrisinæ. These characters must now be considered more in detail. In size the orbits are proportionately smaller than in any of the recent representatives of the subfamily, and indicate an animal of diurnal habits. A percentage-ratio, comparing the transverse diameter of the orbit with the bi-zygomatic breadth, gives the number 23. Similar indices in the case of *Propithecus*, *Indris*, and *Avahis* respectively give 34·2, 37·3, and 41. Except in quite young skulls the margin of the orbital process of the frontal is raised to form a strong bony rim, which is continued around the external and anterior margin by a similar growth of the malar. The latter bone attains an extraordinary depth and breadth below the orbit. The distance measured from the external anterior

* For further details the reader is referred to the report by Dr. Elliot Smith on the brain-casts of *Palæopropithecus* and other recently discovered Primates published as an appendix to the present memoir.

margin of the orbital rim to the lower end of the suture of the malar with the maxilla exceeds the diameter of the orbit itself (text-fig. 10). No extant Lemur exhibits this peculiarity, which is only paralleled by some of the Old World Apes (e. g. *Papio*). In the case of *Palæopropithecus* a broad plate of bone frequently stretches across between

Text-fig. 10.



Front view of skull and mandible of *Palæopropithecus maximus.*

the lower posterior margin of the orbit to join the zygomatic arch, thus walling in part of the temporal fossa. The plane of the orbital rim is more upwardly and forwardly directed than in *Indris* or *Propithecus*. The angle made by this plane with a plane passing through the lower margins of the orbits and the upper margins of the external auditory meatus (the horizontal plane of the Frankfort Convention) may be compared with that occurring in the three extant genera thus:—

Palæopropithecus	52°
Indris	73°
Propithecus	77°
Avahis	47°

The intersection of the plane of the orbital rim with the median sagittal plane gives an angle which is a measure of the extent to which the orbits are directed forwards. For the same series of skulls these angles are approximately as follows:—

Palæopropithecus	55°
Indris	50°
Propithecus	53°
Avahis	50°

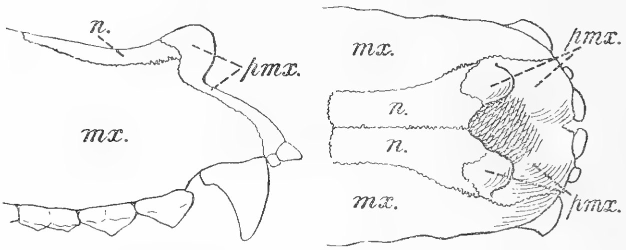
In form and arrangement the various elements constituting the inner wall of the orbit agree in general with the corresponding bones in *Propithecus*. The following deviations from the type of the recent Indrisinæ may be noted. The lacrymal enters to a very limited extent into the face, but has a considerable downward extension within the orbit, resembling the condition seen in some of the Hapalidæ and Cebidæ (see text-fig. 48, p. 152). It has at the same time a very considerable extension in a direction in line with the orbital rim. The inner edge of the orbital rim shows an extraordinarily developed elevation, forming in some old specimens a roughened prominence 5 mm. high and 10 mm. or more in length. The lacrymal fossa is entirely surrounded by the lacrymal bone, and in most specimens the foramen is well within the orbital margin. In the youngest skulls which I have been able to examine the foramen is in line with the sharp inner edge of the orbital margin, and, strictly speaking, this condition generally still obtains in the adult, though the great forward and upward development of the orbital rim as adult age is reached leaves the whole fossa well within the orbit.

The small size and elevated position of the orbits on the one hand and the constricted postorbital region on the other, naturally alter the contours of the maxillary and frontal bones in this part of the skull. In *Indris* the posterior part of the maxilla is inflated by an extensive aërial sinus and forms a veritable floor for the eyeball. In *Palæopropithecus* the maxilla rises up to form an extensive fronto-maxillary suture between the lacrymal and the ethmoid, but forms no horizontal floor as in the extant genera. The ethmoid has been mentioned as entering the orbit in *Palæopropithecus*. There is apparently in young skulls in the position where this bone occurs in *Propithecus* (viz., at the point where the frontal, maxilla, orbito-sphenoid and palatine all approach each other) a small *os planum* which early fuses with the end of the palatine, and in older animals is drawn in away from the orbital wall by the sinking in of the margins of the spheno-palatine and postpalatine foramina.

The great depth of the malar below the orbit has been referred to. Below and within the outer orbital margin this bone is triangular in section, presenting a distinct inner ridge which partially walls in the orbit behind. A downwardly extending ridge of the frontal serves a similar purpose in the upper part of the orbit. We shall have occasion in succeeding sections to notice a similar condition of the postorbital bar in several of the other subfossil Malagasy Lemuroids.

The Nasal Region.—The nasals are broad and flattened as compared with those of the modern genera. Their median suture is early obliterated, as also are those they make with the frontal and maxilla, but their contour can be readily traced on a young skull. Each nasal sends out a rounded wing to meet the anterior angle of the lacrymal. The *nasalia* are slightly constricted in the front of this point, the two edges running parallel for a short distance, when they again broaden out, resembling closely the corresponding part in *Archæolemur*. At their anterior end the nasals are curiously turned up, and along their outer anterior margin form a suture with an upwardly projecting wing of the premaxilla (text-fig. 11). The two bones together form an extraordinary snout-like convexity, the smooth inner surface of which is continuous with the walls of the nasal fossæ. The outer surface of these nasal convexities is

Text-fig. 11.



Muzzle of *Palæopropithecus maximus*, showing upwardly extending wings of premaxillæ fused to anterior borders of nasals.

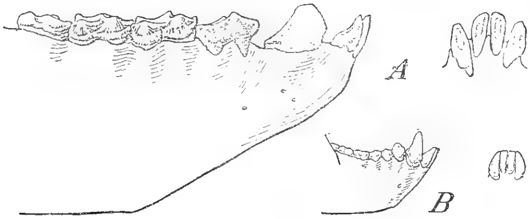
roughened as though for the attachment of some epidermal excrescence. The anterior contour of the narial opening thus formed is heart-shaped as viewed from the front.

In old animals the premaxillæ are fused along the median line of the palate almost to the alveolar margin, though frequently a small lacuna is left unjoined in front of the anterior palatine foramina. The premaxillæ are thus more strongly developed than the corresponding bones of the extant members of the subfamily. Correlated with this condition of the premaxillæ the median incisors have had a more vertical position and have been stouter and stronger teeth proportionately than in *Indris*.

The Temporal Region.—The zygomatic process of the malar has a smaller backward extension than in *Propithecus* (text-fig 13). The squamosal element, on the other hand, almost reaches the posterior margin of the flattened vertical wall below the orbit. The zygomata are proportionately stronger and higher and more outwardly curved than in the extant Indrisinæ. Each arch is attached to the vertical plate of the squamosal by a broad horizontal shelf of bone which extends forward almost to the temporo-sphenoidal suture. The presence of this horizontal plate combined with the constriction of the postorbital frontal region gives to the temporal fossa at this level an almost circular horizontal section (Plate XIII.). The massive lower jaw and widely extended mandibular alæ were evidently associated with very powerful temporal muscles.

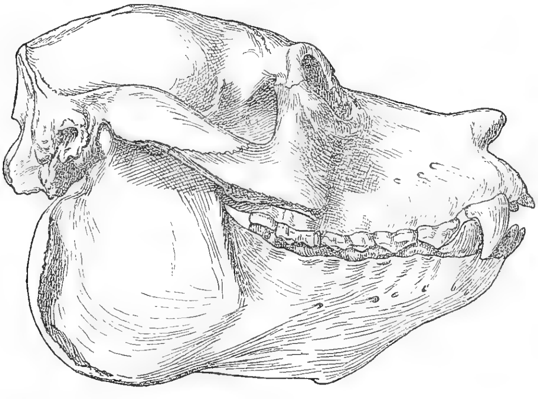
The temporal region of *Palæopropithecus* has already been referred to as possessing one feature of considerable interest, namely, the absence of the inflated auditory bullæ which are so prominent and characteristic a feature of the Lemurs (Plates X. & XIV.). This fact is the more interesting as it is associated in *Palæopropithecus* with the possession of an external auditory meatus of considerable length. The tympanic bone has the same contour as that observable in recent Lemurs, but instead of being inflated and globular in form it has actually a smooth *concave* surface. The disappearance of the bullæ is associated with several minor changes, to which reference may be briefly made. The outer pterygoid laminæ of the alisphenoids are widely everted and sharply truncated at their posterior border, the flat plate or bony bridge which in *Propithecus* or *Indris* connects this bone with the auditory bulla being, of course, entirely absent.

Text-fig. 12.



Inclination of lower incisors of (A) *Palæopropithecus maximus* and (B) *Pithecia rufiventer* compared. In disposition the latter bear more resemblance to the usual Indrisine type. (See also text-figs. 18 and 22.)

Text-fig. 13.



Restoration of cranium and mandible of *Palæopropithecus maximus*. × $\frac{1}{2}$.

The flattening down of the suture between the alisphenoid and the tympanic leaves the *foramen lacerum medius* widely exposed, and the orifice of the Eustachian duct, *foramen rotundum*, and *foramen ovale* are all crowded together at the posterior end of this opening. On tracing the Eustachian duct outwards and backwards towards the auditory meatus it is found to open into a narrow chamber greatly flattened in a vertical direction and occupying a position just internal to the postglenoid process. Its inferior wall is much thickened. This shallow chamber apparently represents the vestigial auditory bulla. There is a curious massing together and proliferation of the parts around the meatus, forming a tube of more than 1 cm. in length. An irregular and variable mass of bone is, in fact, always present in this region produced by the anchylosis or close apposition of the following elements :—the postglenoid process, the external margin of the tympanic, the mastoid process, and the paroccipital process. This mass of bone is pierced by the stylo-mastoid foramen and the postglenoid foramen. The actual margin of the external auditory meatus is formed by the petrous portion of the squamosal and by the tympanic.

The Dentition of Palæopropithecus. (Plate X.)

As already stated, the dental formula of *Palæopropithecus maximus* corresponds with that of *Indris*, *Propithecus*, and *Avahis*. A detailed comparison with these three genera shows that in several particulars *Propithecus* exhibits the closest analogy with the fossil form. We may instance specially the shape of the premolars. The median pair of incisors are much larger than the lateral. Both pairs are cylindrical in section. The inner pair are curved towards each other at their lower extremity. Their worn surfaces show that all four have been apposed to the extremities of the lower incisors as in *Archæolemur*. The inclination of both upper and lower incisors bears a close resemblance to the condition seen in some of the Platyrrhine Monkeys (e. g. *Pithecia*) (text-fig. 12).

The canines are triangular in section, presenting a strong anterior ridge which is separated by a deep groove from a broader internal ridge. A small posterior cusp is present, as in all the extant representatives of the subfamily. The anterior premolar does not differ materially from the corresponding tooth of *Propithecus*, except that it is narrower in a transverse direction. The whole series of molars and premolars is in fact decidedly narrower than in any of the recent forms. The anterior premolar is constricted near the centre of the lingual margin, thus being divided into a narrower anterior and a broader posterior portion, the same feature being seen to a less degree in the posterior premolar. The second premolar bears a very small cusp on its inner margin, the homologue of which is traceable in *Propithecus*. The anterior ridge of this tooth curves outwards to join the external cingulum, but without giving rise to a pointed cusp as in *Propithecus*. The strongly developed anterior and middle labial cusps of *Propithecus* are represented in *Palæopropithecus* by slight elevations of the external cingulum. In the first molar the internal cusps are not subequal as in the recent genera, but the anterior one is greatly in excess of the posterior both in height and length. The same is true of the second molar, though here the extant Indrisinæ bear some resemblance to the fossil form. This flattening down and reduction of the postero-internal cusp of the molars is of special interest, as indicating a transition to a tri-tubercular form; indeed the condition of the molars in some of the Lemurinæ which have a strong postero-internal cingulum does not materially differ from that seen in *Palæopropithecus*. The transverse ridge joining the posterior labial cusp with the hinder edge of the anterior lingual cusp in the first molars of *Propithecus* is traceable in *Palæopropithecus*. The third molar of the fossil genus is greatly reduced, the two outer cusps having quite disappeared and being represented by a line of small nodules; the inner posterior cusp has also gone in most specimens. The series of the premolars and first and second molars form nearly straight lines which converge but little towards the anterior part of the palate.

The appended table (p. 86) gives the dimensions of the teeth of a series of skulls. It will be seen that considerable variations occur, as might be expected from the great diversity in the size and proportions of the skulls themselves. The teeth of the lower jaw of *Palæopropithecus ingens* have been described by Dr. Grandidier, and these agree so closely with the larger species that it does not seem necessary to describe them minutely again. The annexed tables (pp. 84–85), giving detailed measurements of a series of skulls and mandibles, will serve to supplement the foregoing description.

Genus Mesopropithecus (Standing).

Definition.—Subfossil Indrisinæ retaining many pithecoid features. Brain-case rounded, and showing constriction of postorbital frontal region. Sagittal and lambdoidal crests generally present. Interorbital frontal region elevated, with steep facial angle. Orbits small and forwardly directed. Postorbital bar triangular in section. Nasals short and broad. Zygomata high and arched. Palate broad. Series of molars and premolars parallel. Mandible massive, with inclined symphysis. Auditory bullæ prominent.

Dental formula: $\frac{\text{i. } 2 : \text{ c. } 1 : \text{ pm. } 2 : \text{ m. } 3}{\text{i. } 2 : \text{ c. } 0 : \text{ pm. } 2 : \text{ m. } 3}$.

Mesopropithecus pithecoides (Standing). (Plates XXI.–XXIII.)

Among the Lemuroid remains in the collection of the Académie Malgache are four skulls which, while agreeing in many respects with the existing genera of the subfamily of Indrisinæ, differ from these latter in so many important particulars that they must be referred to a new genus. To this I have given the name of *Mesopropithecus*. All the four skulls belong to a single species, which I propose to call *pithecoides*.

As this specific name implies, the new genus presents certain well-marked pithecoid characters. While agreeing in the main with the recent Indrisinæ, it shows also many striking resemblances to *Archæolemur* (*Nesopithecus*). Its main interest indeed lies in the fact that it definitely connects the Archæolemurs with the Indrisinæ, and hence throws a clear light on the origin of the modern genera of this subfamily.

TABLE 2.—Giving dimensions (in millimetres) of thirteen skulls of *Palæopropithecus maximus.*

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	From lower margin of foramen magnum to alveolar border of premaxilla	160·3	169·9	162·3	[192]	178·4	178	184	182·6	186	196·6	190·2	181·2	[202]
2.	Maximum length of skull	182	[185]	181	203	196	203	202·5	195	197·8	[193·5]	203	[195]	216
3.	From lower margin of orbit to upper margin of foramen magnum	123	126·7	126	[132·3]	129	136·2	139·7	139·7	136	135·6	137	135·5	143·5
4.	From lambdoidal crest to fronto-nasal suture													
5.	Length of palate along median line	130·5	129·7	128·7	[131·3]	133	138	145·3	[128]	135	131	141	[141]	138·5
6.	From lower margin of foramen magnum to posterior edge of palate	85·7	82·7	89	101·5	94·4	94	92·8	88	94	[88]	96	92·5	105
7.	From lower margin of orbit to alveolar border of premaxillæ	64·5	63·6	65·5	73·6	71	68·8	68·8	66	64	68·8	73	69·8	78
8.	Length of series of molars and premolars ..	70·5	73·7	72·7	76	72·6	71·5	76	71·5	75	75	71·4	70·8	76·5
9.	From anterior surface of postglenoid process to posterior edge of third molar	63	65	61	76	70·5	73	72·5	76·5	72	72·6	76	73	80
10.	Vertical diameter of orbits	28	29	29	35·5	30·8	27·3	33·5	31	28·5	31·5	27·5	28	35
11.	Transverse diameter of orbits	27	27	24	32	28	28	29	26	26	28	27	26·5	33·5
12.	Maximum external height of brain-case	57	57·7	56·2	61	59	62·6	61·5	62	59	[58]	55	..	65
13.	Bi-zygomatic breadth (external)	113	[121]	[120]	[136]	120	[120]	[118]	[129]	118	121	[119]	117	135·5
14.	Maximum external breadth of brain-case ..	64	61	62·3	[79]	70	70	67	68·5	67	67	64	64	71
15.	Breadth between styloid processes	58	50	65	[56]	57	60	65	65	60	58·5	62	63	[60]
16.	Transverse diameter of foramen magnum ..	23	20	24	..	21·4	21·7	26	23	22	26	20·6	25	
17.	Vertical diameter of foramen magnum	24	21	25	..	26·5	21	24	22	18	26	22	19·5	[22]
18.	Distance between orifices of auditory meatus.	[79]	78	81	..	83	85	77·5	93·5	86·5	92	84·2	89	101
19.	Breadth of skull at level of orbits	37·4	34	38·3	40	36·6	36·4	35·5	34·3	35·4	35·8	28	40	40·2
20.	Breadth between lacrymal foramina	27	34·8	34·2	35·6	31·8	33	33·6	[35]	33·3	32·3	35·3	33·5	33·8
21.	Breadth of palate between third molars (internal)	27	27·5	25·7	29	27·8	27·8	28·8	29·2	29	26	27·7	[28·5]	31·8
22.	Breadth of palate between antero-internal margins of canines	22	[24]	29	..	..	31·5	[30·8]	[33]	33	30	[32]	[30]	[39]
23.	Maximum breadth of nasalia	[26·5]	31	[31]	36·2	35	32	39·1	35·5	31·5	33·5	36	[35]	39
24.	Minimum breadth of nasalia	[17]	20	18·5	19·2	20·2	21·2	18	20	20·8	18·5	18	17·5	21
25.	Maximum width (height) of zygomatic arch .	19·6	22	[20·9]	24	[20·8]	..	[20]	24·5	20·8	14·5	[24·2]	[13·2]	26·7

TABLE 3.—Giving dimensions (in millimetres) of mandibles of *Palæopropithecus maximus*.

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.	From condyle to tips of incisors....	178·5	167	170·2	146											
2.	From condyle to summit of symphysis	179·5	166·5	169·8	148											
3.	From lower end of symphysis to a line joining inferior angles	116	106	105	94											
4.	From coronoid process to inferior angle	109·5	93	92·8	85											
5.	Maximum distance from condyle to inferior angle	109·5	86	100·8	84·2											
6.	Length of series of molars and premolars	65	65	68	63	67	[68]	66	66	62	65	66	64	65·5	60·5	65
7.	From posterior edge of last molar to postero-inferior angle	110	100·2	100·5	84											
8.	From condyle to posterior edge of last molar	71·1	71	63·2	53											
9.	Length of symphysis	85·8	91·5	86	74·5	87·5	94·5	[81·5]	92·5	83	87	[78]	74·2	82·1		
10.	Distance between coronoid processes	88	..	..	70·5											
11.	Distance between condyles	74·9	..	..	76											
12.	Distance between inferior angles ..	86	..	66	76·5											
13.	Breadth between rami behind third molars	40	32	33	40	..	..	33·2								
14.	Length of three molars	48	48	50	46	49	[50]	49·8	49	46·5	47·5	49·2	48	49·8	44	49
15.	Space occupied by dental series from median incisors to third molars..	101·5	95	105	88	..	106	95	104·5	93	[99]	..	[92]	101·5		
16.	Space occupied by two premolars ..	17	17	18	17	18	19	17	17·2	16	18	19	16·5	17	16·2	17
17.	Thickness of jaw at level of first molar	12·2	10·2	12	13	12	11	10	12·5	11·5	11·5	12·9	11·2	12	11·2	13
18.	Height of jaw at level of first molar (including tooth)	52	52	53	47·5	53·2	47	46	48·2	46·2	43	40·8	38	48	[39·5]	[51]

TABLE 4.—Giving dimensions of teeth of *Palæopropithecus maximus*.

A.—UPPER JAW.

			1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
			mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
1.	Height of canine		...	...	18	...	22	19·2	...	...	19	19	...	...	[16·5]
2.	Breadth of canine (ant.-post.)		...	...	19·2	...	16·9	16·8	...	[15]	17	18·8	...	...	19·5
3.	Total length of molars		44	44	43·8	45·9	44·8	44	45·5	44·2	45·2	44·4	42	43·2	46·2
4.	First premolar	length (ant.-post.)	17	17	16·8	[12]	16·2	16	17·9	15·7	17·8	18	15·2	15·9	17·8
		breadth (transverse)	9·7	9·7	9·3	[8·5]	9·2	8·3	9·7	8·5	10·2	9·5	9·8	8·2	9·8
5.	Second premolar	length (ant.-post.)	14·9	17·2	16	15·7	15·5	14·8	15·9	15·2	15·5	16·2	14	14·8	14·8
		breadth (transverse)	11·8	13	12·5	12	11·8	11	11·7	11·7	12·8	12·9	11	11·7	12·2
6.	First molar	length	18·2	19·9	18	19·5	19·2	18·5	18·3	19	18·8	18·7	16	17·8	19
		breadth	13·2	13·8	14	8·7	13·7	13·2	13	12·8	13·8	12·2	13	13·7	14·8
7.	Second molar	length	18	18·2	18	18·3	17·8	17·5	18·5	18	18·7	18·2	16	18·5	18·8
		breadth	12·2	12·9	12·7	8	13	13·7	13·1	13	13·5	12·8	12	12·7	11·9
8.	Third molar	length	9·8	9·5	9·9	10·5	10·2	9·8	10·8	8·5	10·8	9·8	10	9	10·8
		breadth	8·9	9·8	8·9	9·3	9·8	9·5	9·8	8·8	10·5	9·5	8·8	8·8	9·8
9.	Median incisor	height	...	...	...	...	...	9·8	...	...	11·2	...	...	...	...
		breadth	...	...	...	...	...	7·9	...	...	8·7	...	...	...	...
		thickness	...	...	...	...	...	5·5	...	...	5·5	...	...	...	...
10.	Lateral incisor	height	...	...	...	...	4·3	4·5	...	...	3·8	...	...	4	...
		breadth	...	...	...	...	4·5	4·8	...	...	4·8	...	...	5	...
		thickness	...	...	...	...	3	2·8	...	...	2·8	...	...	3	...
11.	Total length of premolars		28·7	31·2	32	33·5	30	30·2	32·2	29	32	32·2	30	30	33·5

B.—MANDIBLE.

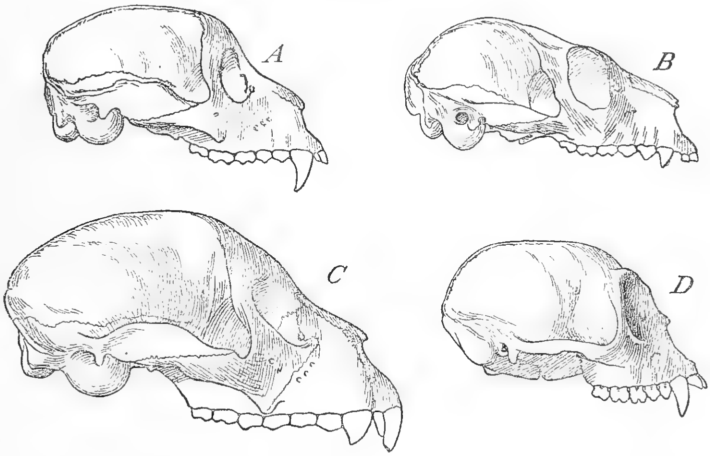
			1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.	Height of caniniform premolar		12	13·5	13	13	11	14	13	13	...	[9·8]	14	12	13	13	...
2.	Breadth of caniniform premolar		16·6	16	18·8	17	18	19	17·6	18	...	7	18	18	19	17	...
3.	Second premolar	length	17	17	18	17	18	19	17	17·2	16·5	18	19	16·5	17	16·2	17
		breadth	8	8·5	10	9	9	9	9	8	7·5	8·5	10	18·2	9	8	9·6
4.	First molar	length	17	18	18·5	17	17	18	18	18	17	17	18	18	17·5	16·8	18·3
		breadth	11	12	12	11	11·8	12·3	12	17·3	10·9	10	12	11	11·3	9·5	12
5.	Second molar	length	17	16	17·5	15	17·5	18	17	17	15·5	16·5	17·2	16	18	16	17
		breadth	10·3	10·9	11	10·5	11	11	11·5	11	9·8	10	11·5	10	10	9	10
6.	Third molar	length	14	14	14	14	14·5	...	15	14	13·5	14	15	14·9	15	14	14
		breadth	9	9	10	9	8·5	...	10	9·3	9	9·3	9·8	9·9	9·5	9	9·5
7.	Median incisor	height	8·5	9	10	...	...	8	...	10	10	...	...	...	9·2	...	...
		breadth	5	5	5	...	5	5	...	5	5	...	...	...	5	...	...
		thickness	5·5	6·5	6·6	...	6	6	...	6·3	6	...	...	...	6·5	...	...
8.	External incisor	height	8	10	10	8·3	...	9	12	9·2	9	[7]	...	10	9	...	...
		breadth	5	5·5	6	5·9	5·5	6	5	5·5	6	5·3	4·2	5·8	6·5	...	...
		thickness	7	7	7·5	7	7	7·8	7	6·2	6·2	7	[6·5]	7	7	...	...

Description of the Skull of Mesopropithecus pithecoides.

The main features of the skull of *Mesopropithecus* may be briefly summed up. The brain-case is rounded and proportionately more voluminous than that of *Palæopropithecus*, and in its general conformation closely resembles that of *Archæolemur*.

The frontal region is prominently convex, and the orbits comparatively small and forwardly directed. The muzzle is broad and truncated. The zygomatic arches are high and widely spreading, giving the skull a rounded form not seen in the present Indrisinæ. The profile is even more Ape-like than that of *Archæolemur* (text-figs. 14 & 19, and Pl. XXI.).

Text-fig. 14.



Profiles of (A) *Mesopropithecus* and (C) *Archæolemur* compared on the one hand with (B) *Indris* and on the other with (D) an Old World Monkey.

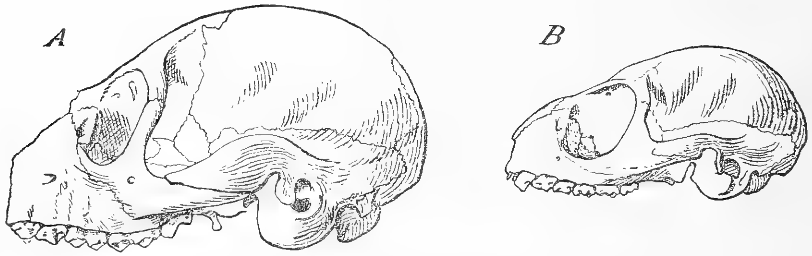
The most satisfactory method to be followed in describing the skull of *Mesopropithecus* will be to compare it on the one hand with *Archæolemur*, and on the other with its nearest extant allies *Propithecus*, *Indris*, and *Avahis*.

Such a comparison at once reveals the fact that the fossil form is robuster and more massive in every way than the recent Indrisinæ. Not only is it absolutely larger in most of its dimensions, but the various crests and processes are much more strongly developed. The comparison also shows in some respects a closer resemblance to *Indris* than to *Propithecus*. A quite young skull of *Mesopropithecus* also bears a striking likeness to *Avahis* in general conformation (text-fig. 15).

The Occipital Region.—The occiput of *Mesopropithecus* is but little inclined from the vertical in the adult skull, though a young specimen just cutting its canines has a much inclined occiput, the plane of the *foramen magnum* making an angle of but 35° with the horizontal plane.

In the adult the conformation of the occipital region shows a striking resemblance to that of *Archæolemur edwardsi.* The *foramen magnum* is circular or slightly

Text-fig. 15.



Skull of young (A) *Mesopropithecus* compared with that of (B) *Avahis.*

elongated in a horizontal direction. The occipital condyles are widest near their upper extremity, the line of greatest transverse convexity here running obliquely outwards and upwards. In a young skull the median convexity for the lodgement of the central lobe of the cerebellum is strongly marked as in recent genera, but in the adult the condition approaches that of full-grown specimens of *Archæolemur edwardsi.* The paroccipital processes also resemble those of *Archæolemur*, being blunt and pyramidal in form. The lambdoidal crest is prominent, running backwards in a horizontal direction in a manner closely analogous to the condition seen in *Archæolemur.* The supraoccipital enters to but a small extent into the roof of the skull, resembling in this the majority of the higher Apes. Among the existing genera, *Avahis* comes nearest to the fossil in this respect. The lambdoidal suture has a feeble anterior convexity, the curvature being approximately parallel to the lambdoidal crest.

The Parietal Region.—In the parietal and frontal regions further resemblances to *Archæolemur* are noticeable. The brain-case is globular or rather pyriform; it is more elevated than in either *Indris* or *Propithecus* and narrower in the postorbital region. The parietals form a more considerable part of the roof of the brain-case than in either of these recent genera.

The upper lines of attachment of the temporal muscles are either closely approximated along the middle line, or actually meet, forming a more or less strongly marked sagittal crest. This crest is continued forward as far as the coronal suture, when it divides into two curved ridges, which spread widely to form the posterior edge of the raised frontal convexity, and are continued with slight interruption to form the outer edge of the postorbital bar.

In adult animals the median suture is closed along the whole length, in the parietal, frontal, and nasal regions. The spheno-parietal suture is similar in length and position to that of *Propithecus*. The outlines of the squamosal and the extent to which it rises up along the skull-wall closely resemble the condition observed in the modern genera.

The Frontal Region.—The form of the frontal and orbital regions of *Mesopropithecus* sharply differentiates the genus from the extant Indrisinæ, while closely allying it with the Archæolemurs. Different skulls show considerable diversity as to the elevation and amount of convexity of the frontal region between and behind the orbits. In the case of the specimen figured on Plate XXI., this part of the skull is raised so as to be actually higher than the central parietal region, but in every instance the interorbital part of the frontal bone is much more sharply curved downwards than is the case with the extant members of the suborder, thus giving to the profile a very Ape-like aspect.

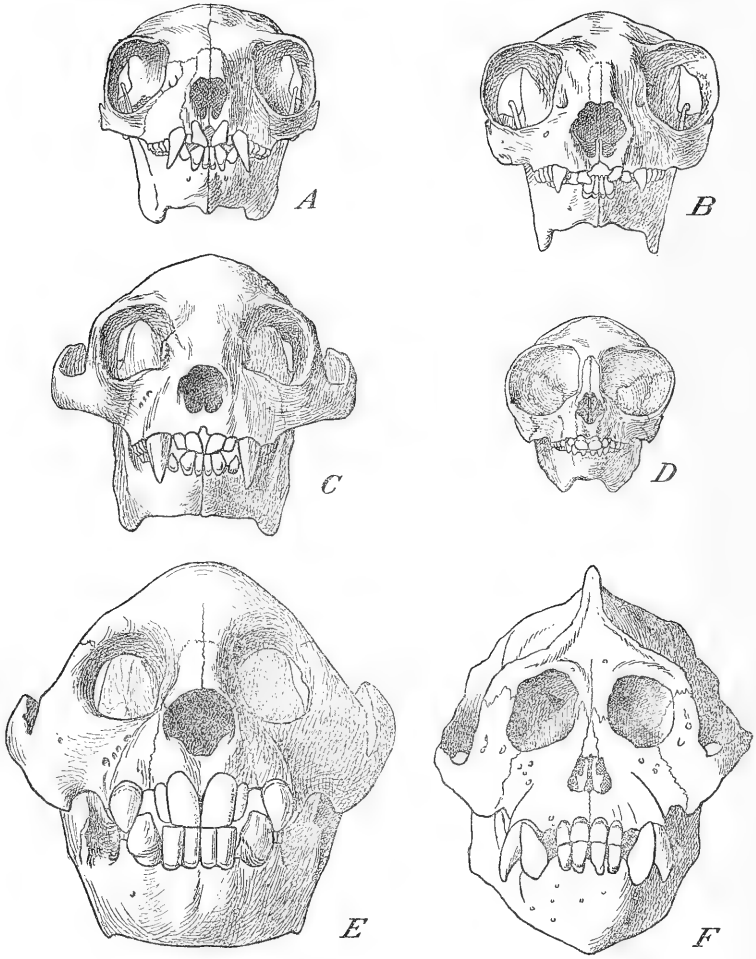
A frontal sinus is present, comparable in extent with that found in *Indris* and *Propithecus*. A noticeable feature of *Mesopropithecus*, and one which we have seen to exist in all the recently extinct subfossil Lemuroids, is the narrowing in of the postorbital region of the frontal bone. The extent of this constriction does not, however, in *Mesopropithecus* appear to be so great as materially to affect the frontal lobes of the brain. There is, in fact, a very close resemblance between the brains of *Mesopropithecus* and *Propithecus* *.

The Orbital Region.—Compared with the existing Indrisinæ the orbits of *Mesopropithecus* are proportionately smaller and more forwardly directed, the postorbital bar is stouter and more distinctly triangular in section, and the malar region while not so deep and strong as in *Palæopropithecus* is considerably more developed than in *Propithecus* or *Indris*. In the case of the last two genera the orbit has so great a lateral extension and the zygoma so flattened a curvature that when the skull is viewed from the front the zygomatic arch is hardly visible. In *Mesopropithecus*, on the contrary, the zygomata spread widely away from the brain-case beyond the external orbital rim, in this respect again closely resembling *Archæolemur* (text-fig. 16).

The development of the malar region in conjunction with the elevated frontal and steep facial angle must have given to *Mesopropithecus* a more Monkey-like face than that even of *Archæolemur*.

* See Appendix by Elliot Smith, *infrà*, p. 168.

Text-fig. 16.



Front view of skulls of (C) *Mesopropithecus* and (E) *Archæolemur*, compared with (A) *Propithecus* and (B) *Indris*, and also with (F) Orang-utan and a nocturnal New World Monkey (D) *Nyctipithecus*.

In the following table the transverse diameter of the orbit of *Mesopropithecus* is compared with the corresponding dimensions of *Archæolemur, Propithecus, Indris,* and *Avahis* respectively. This is also expressed as a percentage-index of the bi-zygomatic breadth of the skull in each case.

	Archæolemur.	*Mesopropithecus.*	*Indris.*	*Propithecus.*	*Avahis.*
Diameter of orbit	29·5	21	23	21	15·5
Orbital index: $\left[\frac{\text{diam.} \times 100}{\text{bi-zygomatic breadth}}\right]$.	27·9	25	37·3	34·2	41·1

The orbital rim of *Mesopropithecus* is less raised and everted than in the two modern genera most nearly resembling it in size; but the postorbital bar is, as stated above, much stouter and stronger. There is the same turning in and extension of the sharp posterior margin of both the frontal and malar portions of this bar as occurs in *Palæopropithecus* and *Archæolemur.*

The infraorbital foramina occupy a similar position to that seen in *Propithecus.*

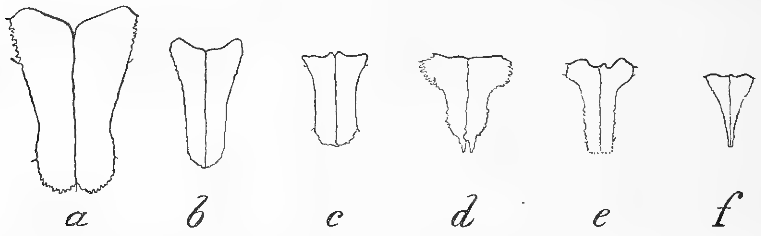
The shape of the lacrymal bone bears a considerable resemblance to that of *Palæopropithecus,* though it has a smaller extension within the orbit and does not completely enclose the lacrymal fossa. The large size of the raised inner margin of the orbit is again another character recalling *Palæopropithecus.* The position of the lacrymal foramen can be best described as being in line with the sharp inner anterior margin of the orbit, though the fossa itself is almost entirely within that margin. There is within the orbit a fronto-maxillary suture separating a small *os planum* from the lacrymal. The posterior portion of the maxilla forms the floor of the orbit, but does not extend backwards so far as in the case of *Archæolemur,* being intermediate both in extent and inclination between the condition of this latter and that seen in *Propithecus.*

The Nasal Region.—The size and shape of the nasal bones strongly recall the same region in *Archæolemur,* though, as before stated, the median suture is entirely obliterated in full-grown specimens. The upper part of the fused bones forms an upwardly curved suture with the frontal, the lower outer extremities of this curve nearly coming into contact with the anterior angle of the lacrymal as in *Palæopropithecus.* The lateral margins of the nasals gently curve outwards, this curvature being accentuated towards their anterior extremity in a manner exactly analogous to that noticed in *Archæolemur* (text-fig. 17). The lower external margin here makes a very short suture with an upward extension of the premaxilla. This condition may be seen in *Propithecus,* though apparently not in *Indris* or *Avahis.* We have seen that in *Palæopropithecus* this upward extension of the maxilla is *external* to the anterior margin of the nasal bones.

The premaxillæ are firmly fused along the middle line almost to the alveolar margin.

The median incisors have thus been brought into close proximity, in all probability, indeed, meeting in the middle line. Unfortunately the incisors are missing in all the specimens, but the alveoli give us indications for determining their position and direction. This region of the palate is more strongly developed than in any of the

Text-fig. 17.



Nasalia of (*a*) *Archæolemur edwardsi* and (*b*) *Mesopropithecus pithecoides*, compared with each other and with those of (*c*) *Propithecus* and of three Monkeys (*d*) *Pithecia leucocephala*, (*e*) *Pithecia rufiventer*, and (*f*) *Chiropotes ater*.

extant members of the subfamily, and it is very probable that the front teeth still functioned as true "incisors," being used for biting and nibbling, as in the case of *Archæolemur*. The nasal aperture is almost circular in form in the one skull where the margins of the encircling bones are intact.

The Temporal Region.—As stated above, the zygomatic arch spreads widely away from the skull, the malar process taking a somewhat upward direction as in *Archæolemur*. This malar element does not extend backwards along the whole lower border of the arcade, though forming a longer horizontal suture than in *Palæopropithecus*. The anterior part of the arch has a much smaller vertical extension than the posterior, the maximum and minimum heights being respectively 16·5 mm. and 7 mm. The whole arcade has a far greater thickness than that seen in any of the extant genera, its conformation, indeed, presenting a strong contrast with these latter and closely allying it with *Archæolemur*. The zygomatic process of the squamosal bears some resemblance to that of *Propithecus*, but it is again more massive in every way and differs also from the latter in having a much greater forward extension of the horizontal plate which connects the skull-wall and the vertical portion of the arcade. This fact, combined with the very convex curvature of the whole arch, has given at this point a nearly circular horizontal section to the temporal muscle, again recalling the condition of *Palæopropithecus* and *Archæolemur* rather than that of *Propithecus* and *Indris*, where the temporal fossa is elongated in a direction parallel to the long axis of the skull.

The sharp superior margin of the zygomatic arch is continuous by a long flat horizontal ridge with the flange-like lambdoidal crest. In *Propithecus* a line may be traced running horizontally backwards above the auditory orifice to join the superior occipital ridge, suggesting the former existence of a similar crest.

In *Mesopropithecus* large auditory bullæ exist, similar in shape and proportions to those of recent Indrisinæ, and there is in old skulls a fusion of the postglenoid process with the bulla.

The Basilar Region.—The obliteration of the sutures observed in the roof of the cranium is again seen in the case of the bones forming its floor. In the oldest skulls hardly a trace remains of the occipito-sphenoid, sphenoid, maxillo-palatine, or maxillary sutures. The external pterygoid laminæ are widely everted at their posterior margins; the glenoid fossæ are broad and deep, resembling those of *Palæopropithecus.* The postglenoid process is broad and strong, and has also a greater vertical extension than in *Propithecus.*

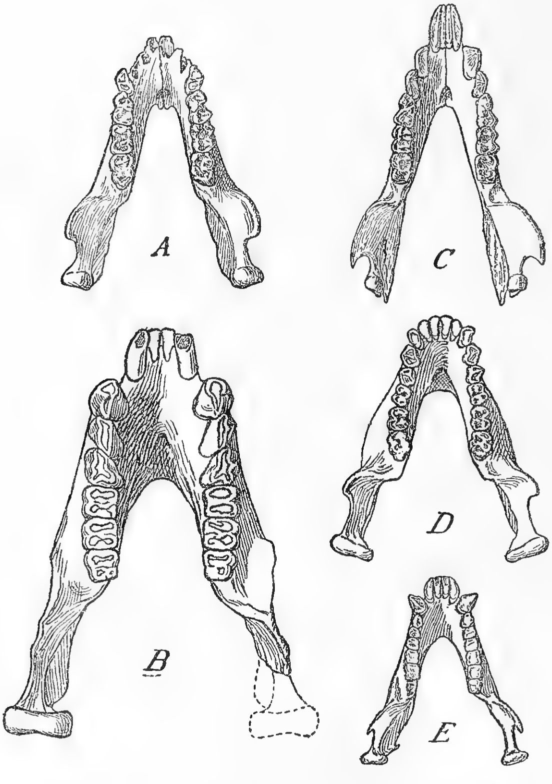
In the palatal region we again see evidence of the stouter and more robust make of the fossil form as compared with all its existing relatives. The posterior margin of the palatines is three or four times as thick as in *Propithecus* and *Indris.* The central portion is depressed (in the direction of the vomer) and in young animals is produced into a short postpalatine spine. The forward extension of the palatine is intermediate in extent between the condition seen in *Propithecus* and *Indris.* The interior part of the palate is much broader than in any of the recent representatives of the subfamily, the distance between the internal margin of the anterior pair of premolars being in excess of that between the first molars. In all recent genera the dental series converge towards the anterior part of the palate; in *Mesopropithecus* they are almost parallel.

Dentition.—The dentition of *Mesopropithecus* so closely resembles that of *Propithecus* and *Indris* that a short comparison with these modern genera will suffice (see Pl. XXI.). As already stated, the inner pair of incisors in *Mesopropithecus,* while larger than the outer, were more nearly equal than in *Indris.* So far as it is possible to judge from the size, position, and direction of the alveoli, the incisors of *Mesopropithecus* were intermediate in function between those of *Archæolemur* and *Propithecus.* There has evidently been some variability as to the position of the external pair of incisors—in one case a short diastema occurring between this tooth and the canine, while in another skull the alveolus is confluent with that of the canine. The same variability in the position of the outer incisor is seen in *Palæopropithecus.*

The canine in *Mesopropithecus* is a large and powerful tooth, having a horizontal extension of nearly a centimetre and a breadth of 4·5 mm. It has a large internal talon overlapped by the anterior margin of the second premolar. This latter and the following tooth bear a strong likeness to the corresponding teeth of *Palæopropithecus,* though the greater prominence of the backwardly sloping central external ridge and the development of the small labial cusps ally these teeth even more closely to those of *Propithecus.*

The first and second molars by the strong development of their acute internal cusps are again closely related to the three recent genera, though, on the other hand, the flattening down of the small lingual cusps of these teeth recalls the condition of *Palæopropithecus*. The third molar is much reduced as in all the Indrisinæ, though its antero-internal cusp is less vestigial than in most of the other genera.

Text-fig. 18.



Mandibles of (A) *Mesopropithecus pithecoides* and (B) *Archæolemur edwardsi*, viewed from above, and compared with those of (C) *Indris* and Old and New World Monkeys (D) *Colobus* and (E) *Pithecia*.

Turning to the mandible, we find here again a condition intermediate between that of *Archæolemur* and *Propithecus*. The massive character of the whole jaw, the great vertical height of the body of the rami, the strong development and almost vertical direction of the anterior margin of the alæ, the form and size of the coronoid process, the broad condyle, the wide-spreading angle of the lower margins of the mandibular rami carrying the lower edge of each ramus outwards to such an extent as to cause the posterior molars to overhang within the jaw, such are some of the characters in which *Mesopropithecus* approaches *Archæolemur* and in most of which also it resembles the ordinary Simian type of mandible (see text-fig. 18, where the mandible of *Mesopropithecus* is compared with those of *Colobus* and *Pithecia*). The mandibular symphysis has about the same relative length as in *Propithecus*. The lower incisors are missing, but the alveoli show them to have been somewhat rounded in section and not laterally flattened as in the existing genera. The outer pair were larger than the inner and the alveoli of the inner pair are decidedly anterior in position to the outer, herein again resembling *Archæolemur*. All four incisors appear to have been somewhat procumbent, the angle approximating to that seen in *Propithecus*.

The anterior premolars are missing in our specimens, but the remaining teeth bear a very close resemblance to those of *Indris* and *Propithecus*. The first premolar is much everted at its anterior margin.

The three molar teeth call for no special notice, except to state that they are in general stouter and broader than the corresponding teeth of *Indris* and *Propithecus* and in their conformation show affinities with both these genera.

TABLE 5.—Showing affinities of *Mesopropithecus* with recent Indrisinæ and with *Archæolemur*.

	Archæolemur edwardsi.	*Mesopropithecus pithecoides.*	*Propithecus diadema.*
Constriction of postorbital region of frontals	*	*	
Obliteration of sutures	*	*	
Presence of strongly developed crests	*	*	
Broad occipital condyles	*	*	
Size and shape of bullæ	*	*	*
Size of orbits	*	*	
Forward direction of orbits	*	*	
Vestige of postorbital septum	*	*	
Size of zygomatic arches	*	*	
Position of lacrymal fossa	*	*	
Facial angle	*	*	
Procumbency of lower incisors	..	*	*
Dental formula	..	*	*
Parallel disposition of dental series	*	*	
Contact of upper median incisors	*	*	*
Shortness of muzzle	*	*	
Shape of nasals	*	*	
Angle of symphysis of lower jaw	..	*	*
Shape of condyle of mandible	*	*	*

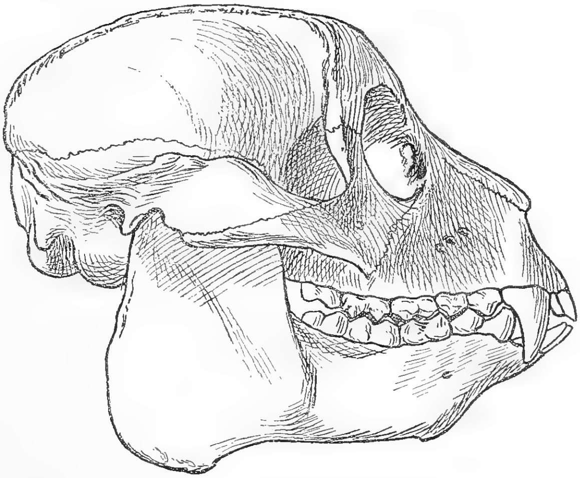
TABLE 6.—Giving dimensions of four skulls of *Mesopropithecus pithecoides*.

		1.	2.	3.	4.
		mm.	mm.	mm.	mm.
1.	From lower margin of foramen magnum to alveolar border of premaxillæ	..	85·5	81	87·5
2.	Maximum length of skull	..	101	94·5	101
3.	From lower margin of orbit to upper margin of foramen magnum	58	69	67·5	70·5
4.	From lambdoidal crest to fronto-nasal suture	63	[75]	75	81
5.	Length of palate along median line	..	40	[35]	40·8
6.	From lower margin of foramen magnum to posterior edge of palate	33	45	[46]	47
7.	From lower margin of orbit to alveolar border of premaxillæ	..	33	33	33·5
8.	Length of series of molars and premolars	32	[32]	34	34
9.	From anterior surface of postglenoid process to posterior edge of third molar	19	30	[28]	30
10.	Vertical diameter of orbits	18·9	..	18	20
11.	Transverse diameter of orbits	17	..	18	20
12.	Maximum vertical diameter of brain-case (external)	33·5	38	37	39·5
13.	Bi-zygomatic breadth (external)	57·5	76	72	80
14.	Maximum external breadth of brain-case	42	48	48·5	49·2
15.	Breadth between styloid processes	26	[29]	[28]	29·5
16.	Transverse diameter of foramen magnum	14	14·5	15	12
17.	Vertical diameter of foramen magnum	14·5	11	12	12
18.	Distance between orifices of auditory meatus	36	36	35	35·5
19.	Breadth of skull at level of postorbital constriction	27	30	29	27·5
20.	Breadth between lacrymal foramina	14	18·5	[19]	18·8
21.	Breadth of palate between third molars (internal)	15	[19]	20	19
22.	Breadth of palate between antero-internal margins of canines	..	[20]	[16·5]	20
23.	Maximum length of nasalia	[19]	[21]	[21]	21
24.	Maximum breadth of nasalia	[9]	15	..	16
25.	Minimum breadth of nasalia	6	8	[8]	9·5
26.	Maximum width (height) of zygomatic arch	10	17	17·5	

TABLE 7.—Giving dimensions of upper teeth of *Mesopropithecus pithecoides*.

			1.	2.	3.	4.
			mm.	mm.	mm.	mm.
1.	Height of canine		..	..	..	14
2.	Breadth of canine (ant.-post.)		..	..	..	8
3.	Total length of molars		21·5	21·6	[25]	22
4.	First premolar	length (ant.-post.)	7	..	6	6·5
		breadth (transverse)	4	..	3·5	4
5.	Second premolar	length (ant.-post.)	5	..	5·5	6
		breadth (transverse)	5	..	5	6
6.	First molar	length	8	..	8·2	8
		breadth	7	..	7·5	7·5
7.	Second molar	length	8	..	8	7·5
		breadth	7·5	..	7·5	7
8.	Third molar	length	5·5	..	6·5	6
		breadth	6	..	6	6

Text-fig. 19.



Restoration of skull and mandible of *Mesopropithecus pithecoides.*

Subfamily ARCHÆOLEMURINÆ.

Subfossil ape-like Indrisidæ which retain the largest number of ancestral pithecoid characters. They retain the "primitive" Primate dentition in the upper jaw, though there is reduction of the third molar. The lower jaw is massive and has many Simian features; it has lost the canine of the permanent dentition. Upper incisors large and functionally important. Lower incisors show incipient tendency to pectinate disposition, which is characteristic of existing genera. Lower first premolar caniniform.

Skull pyriform with narrow postorbital frontal region, long widely curved zygomata, and large auditory bullæ. Lacrymal fossa on or near orbital margin.

Dental formula: $\frac{\text{i. 2: c. 1: pm. 3: m. 3}}{\text{i. 2: c. 0: pm. 3: m. 3}}$.

Synonym: *Nesopithecinæ* (Major).

Genus ARCHÆOLEMUR (Filhol). (Plates XVI.–XX.)

Definition.—Subfossil ape-like Lemuroids with pyriform brain-case, showing marked postorbital frontal constriction. Occipital and sagittal crests frequently developed and interorbital frontal region prominently convex. Incisors and premolars functionally important, the latter having a blade-like disposition in both upper and lower jaws. Lower first premolar caniniform; third molar reduced in both jaws.

Dental formula: $\frac{\text{i. 2: c. 1: pm. 3: m. 3}}{\text{i. 2: c. 0: pm. 3: m. 3}}$.

Synonym: *Nesopithecus* (Major).

It is not my intention to give a full description of the fine series of skulls of

Archæolemurs which have been found at Ampasambazimba, since both Dr. Forsyth Major and Dr. Grandidier have memoirs in hand on this subject. It will be necessary, however, for the purposes of comparison, to point out the salient features of the two species represented in the collection of the Malagasy Academy. I shall also in the present section give a table of the chief dimensions of the complete series of 10 skulls from Ampasambazimba, since the whole material will probably be no longer conveniently available for purposes of comparative study.

It should be pointed out, in the first place, that, as in the case of *Palæopropithecus*, there is a great variety in the size and proportions of this series of skulls. The task of classifying them has been especially difficult from the fact that although various characters may be pointed to as constituting marked differences in different individuals, these individuals cannot be classified as showing *simultaneously* the same set of variations, and, moreover, intermediate types occur even in the case of the most extreme divergences. As an example of this difficulty we may consider the condition of the third molar. The reduced triangular shape of this tooth has been used by Dr. Grandidier as forming the chief criterion for the determination of the genus *Bradylemur*. In the series under consideration three skulls show a distinctly triangular form of this tooth, two have large quadritubercular third molars, while four show various conditions intermediate as to size and shape between the first and second groups. Again, the attempt was made to use the facial angle as a distinguishing character, and it was found that seven skulls had a long, more or less pointed muzzle, so that a line tangential to the alveolar margin of the premaxillæ and the frontal convexity between the orbits formed approximately an angle of 60° with the plane passing through the crowns of the molars and premolars. In the case of three other skulls the line so drawn was more abrupt, giving an angle approaching more nearly to a right angle. Again, the proportionate length of the series of molars as compared with the premolars has been calculated for the whole series of skulls; this expressed as percentage-ratios gives numbers varying from 98·4 to 85·6. In one case, however, the general aspect of the skull is so strikingly different in many important respects from all the rest of the series that it seems justifiable to make a specific distinction in this instance, and the name *platyrrhinus* is proposed for this skull. Its distinguishing features will be enumerated after a brief general description of the other members of the series. I have, through the courtesy of Dr. Smith Woodward, had the opportunity of comparing these latter skulls with the type specimen of *Archæolemur edwardsi* in the British Museum and have no hesitation in referring them to this species.

Description of Skull of Archæolemur edwardsi (*Filhol*). (Plates XVI.-XVIII.)

The skull of *Archæolemur edwardsi* bears a close general resemblance to that of *Archæolemur majori*, but besides its greater size and more robust proportions, it differs from this best-known species in several important particulars; these will be referred to in detail during the course of the following description.

Occipital Region.—The plane of the occiput is somewhat less inclined than in the case of *A. majori.* The occipital crest is in most specimens very strongly developed, rising up in a flange-like projection nearly 1 cm. in height. It is continued as far as the auditory meatus. In some skulls a raised line connects the occipital crest with the posterior and upper margin of the zygomatic arch in a manner suggestive of the condition seen in *Mesopropithecus*, though the two bony flanges are not confluent as in the latter genus. The position of the occipital condyles does not materially differ from the condition observed in *A. majori*, though they tend to occupy a larger part of the circumference of the *foramen magnum* and to be somewhat broader in their upper portion in the larger species.

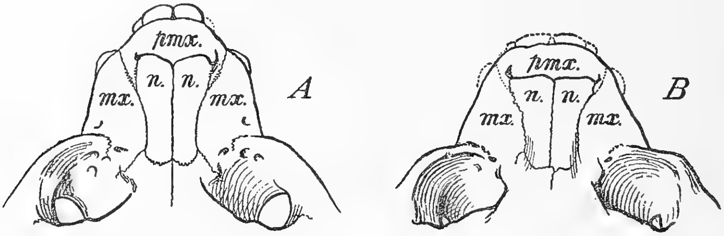
Parietal Region.—In old skulls of *A. edwardsi* the brain-case has the appearance of being more depressed and relatively less voluminous than in the smaller species, but probably this is in part due to the great development of the sagittal crest and the very prominent frontal convexity which many of these skulls show. A small raised triangular area is present on the supraoccipital, and from the apex of this triangle the sagittal crest runs forward as a prominent blade-like ridge (Plate XVII.).

Frontal Region.—About 1 cm. in front of the coronal suture the edges of the sagittal crest rapidly diverge to form the posterior margins of the prominent frontal convexity above referred to. This feature forms one of the most marked differences between the two species. The central frontal region of *A. edwardsi* behind and above the orbits is raised far above the level of the brain-case, forming a very prominent "forehead." This feature occurs, as we have seen, in some skulls of *Mesopropithecus.* The profile of *A. edwardsi* is thus in this region more steep than that of *A. majori.* An extensive frontal sinus exists beneath this convexity, though it does not appear to encroach upon the brain-substance as in the case of *Megaladapis.* The steep backwardly sloping edges of this frontal convexity accentuate the appearance of extreme narrowness in the postorbital region. This, again, is a feature that occurs in *Mesopropithecus.*

The frontal bone has the appearance in *A. edwardsi* of extending backwards to a greater extent along the skull-wall than in the case of *A. majori*; but measurements along the sagittal suture show that this is more apparent than real, being due to the anterior position of the frontal convexity to which reference has been made.

Nasal Region.—The median frontal suture is obliterated in its upper part, but can be traced even in old skulls in the region between the orbits. The median nasal suture persists in every case, as also does the fronto-nasal suture. The nasal bones of *A. edwardsi* agree essentially in form and proportionate dimensions with those of *A. majori.* The upper external contours of the nasals slightly diverge till the fronto-maxillary suture is reached, below this point in some specimens a slight constriction occurs, when the bones gradually broaden out again to meet long narrow upward projections of the premaxillæ, the broadest part of the bone being quite near its anterior extremity. The free anterior margins when intact follow first a very short forwardly directed course and then converge at a very obtuse angle, finally forming an acute indentation as they meet each other along the median line (text-fig. 20, A).

Text-fig. 20.



Showing form of nasals of (A) *Archæolemur edwardsi* and (B) *A. platyrrhinus.*

Orbital Region.—The orbits of *A. edwardsi* by their size and position closely resemble those of *A. majori*, though they are in many cases somewhat more forwardly directed, owing to the more forward position of the orbital process of the frontal. The shape of the orbital contour varies considerably, not only in its general proportions, but in regard to the exact position and direction of the prominent marginal convexity, and at times the absence of such a definite raised rim has made it difficult to estimate the real diameter of the orbit.

One important and interesting feature of the postorbital bar is the fact that its posterior edge shows a sharp inner blade-like projection, in many cases so thin as to be quite translucent. On some skulls a raised line continues this edge for some distance on the *inner* frontal wall of the orbit. The probable significance of this feature is explained in the last section of this memoir.

The lacrymal foramen is more distinctly within the outer margin of the orbit than in the case of *A. majori*, though this is not due to any material difference in relative position, but to the more definite and prominent development of the anterior margin of the orbital rim.

Temporal Region.—The zygomatic arch is in general more massive than the corresponding structure in *A. majori*, though there are great variations in its size and robustness, one skull showing a maximum vertical height of over 16 mm. The malar has a great vertical depth below the orbit, a feature which we have seen to be still more accentuated in the skull of *Palæopropithecus.* The lower margin of the zygomatic process of the malar is directed abruptly upwards, forming an angle of 45° with the horizontal plane.

The inner contour of the squamosal element of the zygomatic arch is not so evenly curved as in *A. majori*, its anterior border forming, as seen from above, a straight line 1 cm. long at right angles to the long axis of the skull (Plate XVII.).

Basilar Region.—The auditory bullæ are large and prominent, but show considerable variety in shape, size, and relative position. In one skull a deep cylindrical channel exists between the roughened surface of attachment of the *rectus anticus major* muscle and the summit of the bulla, in other cases the condition resembles that seen in *A. majori.*

Very great differences exist in the proportions of the various regions of the skull, the extreme examples diverging so widely as certainly to justify their classification as distinct species did not intermediate forms exist which make such a differentiation impossible. We have seen that the genus *Palæopropithecus* presents the same phenomenon. This extreme variability would appear to be a mark of species approaching extinction.

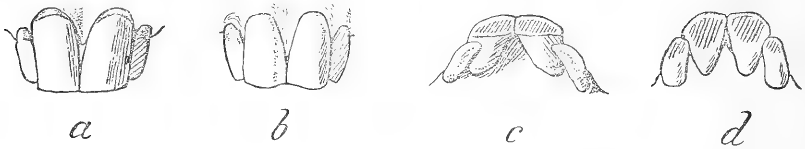
Dentition.—The great variability in the dentition has already been referred to. The occurrence of a triangular third molar was, as above stated, considered by Dr. Grandidier of sufficient importance to form a new genus, *Bradylemur*; but we have seen that in point of fact even specific distinctions cannot be based on the character of this tooth (see Plate XVI.). The first and second molars also show considerable variations in form. In some cases the transverse furrow which separates the tooth into anterior and posterior halves is continued by a strongly marked vertical groove, which again is confluent with the interstice between the anterior and posterior roots of the tooth. In some specimens, again, this vertical furrow is entirely absent, the tooth presenting one unbroken convex internal surface. Here, too, however, an intermediate form exists, so that it is impossible to use this character for purposes of specific distinction.

Reference has been made to the varying proportions and the length of the series of molars and premolars respectively; the fact of this variation will be apparent if expressed in tabular form thus:—

	Length of three molars. mm.	Length of three premolars. mm.	Ratio of molars to premolars.
1	24·6	25	·98
2	27·5	25	1·10
3	23·5	26	·90
4	24	26·3	·91
5	23	25	·92
6	25·2	26·8	·94
7	22	25·7	·85
8	24·6	27·6	·89
9	26·2	28·8	·91

The amount of backward extension of the whole dental series again is subject to much variation, the third molar in some instances almost abutting on the pterygoid fossa, while in other cases a distance of more than a centimetre intervenes. The interval between the third molar and the auditory bulla varies in different specimens to the extent of nearly 15 mm. The posterior margin of the palate has a deep U-shape, its central portion being so far forward that it is generally opposite the first molar. The individual teeth closely resemble those of *A. majori*, the chief variations occurring in the molars. The median pair of incisors are stronger and larger in proportion than even those of *A. majori* and are more vertical in position, bearing indeed a very close resemblance to those of many of the Cercopithecidæ (text-fig. 21). The outer pair of incisors are small and at their inner margins are turned in to such an extent as

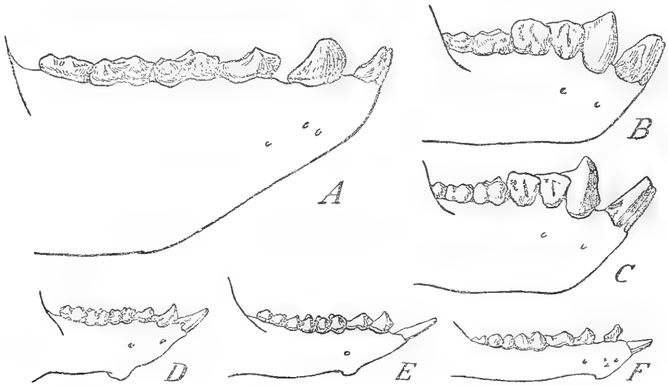
Text-fig. 21.



Upper incisors of (*a*) *Archæolemur edwardsi* compared with those of (*b*) an Old World Monkey (*Macacus cynomologus*); *c* and *d*, the same, as seen from below.

to be slightly overlapped by the median pair, in this condition also not greatly differing from *Papio* and *Macacus*. The incisors of the lower jaw of *A. edwardsi* were apparently more cylindrical in shape and less inclined than those of *A. majori*, though varying degrees of inclination may be observed in different specimens.

Text-fig. 22.

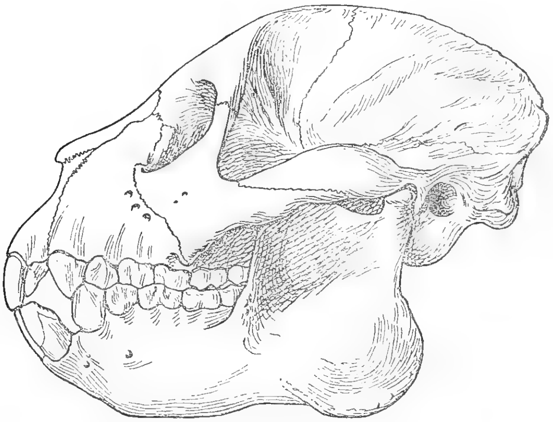


Showing different stages in evolution of pectinate or scraping instrument formed by the lower incisors:—A. *Palæopropithecus maximus*; B. *Archæolemur edwardsi*; C. *A. majori*; D. *Propithecus*; E. *Indris*; F. *Lemur*.

These lower incisors are much more massive teeth than those of *Hadropithecus*, and their worn surfaces show clearly that they were still directly opposed to the upper incisors, and were used for biting just as in the case of the Cercopithecidæ. It should be noticed in this connexion that *A. majori* has apparently gone further in the direction of that specialisation of the lower incisors which in the case of the extant genera of the Indrisinæ and Lemurinæ has resulted in the production of a tool of pectinate form used for scraping and rasping and also for combing the fur. The different steps in the production of this peculiar modification are seen in the accompanying diagram (text-fig. 22).

Dr. Grandidier has in his thesis on fossil Lemurs pointed out the various simian characters of the mandible of *Archæolemur*. These need not here be recapitulated. M. Grandidier regards these simian characters as evidences of *specialisation*, and apparently inclines to the belief that they are the result of convergence, though he frankly confesses he is unable to explain their occurrence. I think there is much more reason for regarding these simian features as *general* ancestral characters and

Text-fig. 23.



Cranium and mandible of *Archæolemur edwardsi*, restored.

the condition of the recent genera of Malagasy Lemurs as *specialised*. But for the full discussion of this question the reader is referred to the last section of this memoir. The very Ape-like character of this genus may be clearly seen from the accompanying restoration of the skull and mandible (text-fig. 23).

ARCHÆOLEMUR PLATYRRHINUS (Standing). (Plate XIX.)

It was stated above that one of the skulls of *Archæolemur* exhumed at Ampasambazimba presented such marked divergences from all the rest that it seemed best to regard it as a distinct species, to which the name *platyrrhinus* has been given. The chief distinguishing characters of this skull will be briefly described.

Description of Skull.

This skull, judged by the condition of the teeth, belonged to a very old animal. There is, nevertheless, an absence of the high prominent crests found in the case of almost all the specimens of *A. edwardsi*.

The median frontal region is much less prominently convex than in the majority of

TABLE 8.—Giving dimensions of nine skulls of *Archæolemur edwardsi* and one skull of *Archæolemur platyrrhinus* (10).

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
		mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
1.	From lower margin of foramen magnum to alveolar border of premaxillæ	115	126·3	124·8	116·5	121	123	130	127	125	122
2.	Maximum length of skull	140	153·8	150	143·4	141·5	146	157	145	138·5	145
3.	From lower margin of orbit to upper margin of foramen magnum	105·4	111·2	107·4	101·2	100	106·5	112·5	103·5	100	107·4
4.	From lambdoidal crest to fronto-nasal suture	99·6	114	109·5	107·7	109	109	113	109	105	109·7
5.	Length of palate along median line	50	55	54	52	..	53·5	58	56	54·5	[50]
6.	From lower margin of foramen magnum to posterior edge of palate	65	70	69	62	..	70	71	70	72	[66]
7.	From lower margin of orbit to alveolar border of premaxillæ	38·5	47	43	43	43	43·5	43·5	48·5	45·5	38
8.	Length of series of molars and premolars	49	52	48·5	49·3	41	51·6	47·5	50·8	53	[50]
9.	From anterior surface of postglenoid process to posterior edge of second molar	38·5	45	44	40	41	42·5	51	43·8	42·8	[43]
10.	Vertical diameter of orbits	35	35	33	30	28·2	30	35	29·3	28	28
11.	Transverse diameter of orbits	25	35	34	29	27	31	34	26·5	24	26
12.	Maximum external diameter of brain-case	56	60·5	58·5	57	58	60	61·5	58	56·3	58·5
13.	Bi-zygomatic breadth (external)	104	114·5	107·3	[103]	..	106	[115]	108·5	106	[112]
14.	Maximum external breadth of brain-case	70	71	69	68·6	69	65·6	71·7	69·5	64·5	73
15.	Breadth between styloid processes	39	44	41	[40]	39	41	41·5	41·8	40	38
16.	Transverse diameter of foramen magnum	21	22	18·6	18	17	19	19	18·5	19	19·3
17.	Vertical diameter of foramen magnum	17·5	17	16	18	15·2	15	17	15·8	15·2	19
18.	Distance between orifice of auditory meatus	69	72·5	68·3	67	..	67	70·3	65·9	59	73
19.	Breadth of skull at level of orbits	34	36·6	31·3	33·7	31	34·4	35·6	33·5	30	32·6
20.	Breadth between lacrymal foramina	27·5	29·2	26	21	24	23	25	27	23	28·2
21.	Breadth of palate between third molars (internal)	24	24	24	23	27	23	23	29	23	[25]
22.	Breadth of palate between antero-internal margins of canines	27	32	32·5	32	[30]	30	32	[31]	31	32
23.	Maximum length of nasalia	[37]	32·2	32·2	..	..	[30]	34	..	..	26
24.	Maximum breadth of nasalia	10	9·8	12	..	20	12·5	12	18	[19]	13
25.	Minimum breadth of nasalia	[7]	5·6	5·6	5	10	7	8	10	10	8
26.	Maximum width (height) of zygomatic arch	10·8	17	15	..	..	15	..	15·8	15·7	

TABLE 9.—Giving dimensions (in millimetres) of mandibles of *Archæolemur*.

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	From condyle to tips of incisors	..	..	..	..	108·5	..	113			
2.	From condyle to summit of symphysis	..	..	112·5	101·5	109·5	115·5	111·5	..	106	
3.	From lower end of symphysis to a line joining inferior angles	..	..	71·5	[68·5]	68	[66]	71·5	72	69	[53]
4.	From coronoid process to inferior angles	..	..	[60]	[57]	[59·5]	[57]	[59]	[58]	[59]	
5.	Maximum distance from condyle to inferior angles	..	..	[69]	[51]	58	[59]	60	55·2	[51]	
6.	Length of series of molars and premolars	53·5	52	45	55	51·5	[49·9]	56·5	50	51	49
7.	From posterior edge of last molar to postero-inferior angles	..	..	..	[38·5]	[43·8]	[45]	42	41·5	[38·5]	
8.	From condyle to posterior edge of last molar	..	..	44	35	36	46	34	35	35·5	
9.	Length of symphysis	[32]	32·5	36	[27·5]	38·2	[36]	39·2	..	[33·5]	[28]
10.	Distance between coronoid processes	..	..	..	..	..	[68]	72			
11.	Distance between condyles	..	..	..	..	..	53	58			
12.	Distance between inferior angles	..	..	[56]	[54]	[54]	[58]	58·5			
13.	Breadth between rami behind third molars	..	39	39	39	34	32	36	..	[34]	40
14.	Length of three molars	[27]	27·5	27	27	25·4	24·5	28	27	27	26·5
15.	Space occupied by dental series from median incisors to third molar.	..	66·8	..	..	66	..	70·5			
16.	Space occupied by two premolars	19·5	17	18·5	18	18	17	19·5	17·5	14	14
17.	Thickness of jaw at level of first molar	15	11·5	14·5	16	15	15	17	14·5	14	12
18.	Height of jaw at level of first molar (including tooth)	[30]	31·2	32·5	28·5	32	33	32	33	28·5	27

TABLE 10.—Giving dimensions (in millimetres) of teeth of *Archæolemur edwardsi*.

A.—MAXILLA.

		1.*	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	Height of canines	15·2	14·5	13	12	...	15	13	...	11	...
2.	Breadth of canine (ant.-post.)	10	12	11·5	10	...	11	10·4	...	12	[11]
3.	Total length of molars	24·5	25	23·3	24·5	23·5	25·5	22·5	24·4	26	[25]
4.	First premolar, length (ant.-post.)	11	12	10·5	10·8	5·2	11·5	10·7	9·7	11·5	10
	First premolar, breadth (transverse)	9	10	9	9	6·8	9	9	7	8·9	8·5
5.	Second premolar, length (ant.-post.)	10·5	12	11	9·8	10·8	12	10	9·8	11·2	9·7
	Second premolar, breadth (transverse)	9	8·8	8·5	8	7·5	9	18·5	8·2	8·8	7·3
6.	Third premolar, length (ant.-post.)	9·5	9·5	8·6	9·5	8·0	10	8·4	8·8	10	9·5
	Third premolar, breadth (transverse)	11	12·3	11·5	11·5	10·5	12·7	11	11	12·8	11
7.	First molar, length	9	9·3	8·8	9	8·5	9·6	8·5	8·8	10·5	9
	First molar, breadth	10	11	11	11	10	11	10·7	10·8	11·5	10·7
8.	Second molar, length	8·5	8·2	8	7·7	7	8·7	7·6	7·8	9	9
	Second molar, breadth	9·8	10·6	10	10·4	8	10	9·5	8·9	10·5	10
9.	Third molar, length	7	7·4	6·5	6·6	6	7·5	6·6	7·8	7·2	[6]
	Third molar, breadth	8·4	8·8	7·4	8·5	9	8·7	8	7·8	8·5	[7·5]
10.	Median incisor, height	...	...	11	...	...	...	14	12·5	7·8	
	Median incisor, breadth	...	...	9·5	...	...	...	8·7	8·8	[10]	
	Median incisor, thickness	...	...	5	...	...	...	4·3	7·8	[11]	
11.	Lateral incisor, height	8·5	...	11·7	...	...	...	10	11	[4·8]	
	Lateral incisor, breadth	5·5	...	5	...	...	...	5	6·3		
	Lateral incisor, thickness	1·5	...	4	...	...	...	1·7	4·8		
12.	Total length of premolars	25	29·5	25·4	26	23	27	26	27·3	28	27·8

B.—MANDIBLE.

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	First premolar, height	15	14	16·5	17·5	15	17·5	12	11	...	12
	First premolar, breadth	11·5	11	10·5	11·5	10·9	11	12	10	...	8·5
2.	Second premolar, length	11·5	9·9	10	10·6	10·8	8·9	10	10	8·5	8
	Second premolar, breadth	9·5	8·5	8·2	10	10·8	8	11·6	8	8·5	4
3.	Third premolar, length	10·5	10	10	9·5	10·2	9·5	10	10	10	9·5
	Third premolar, breadth	9·8	10	9·8	9·9	9·5	9	10	9	8·5	8
4.	First molar, length	...	[10]	9·5	10	9·5	8·9	9·8	9	9	8·2
	First molar, breadth	9·8	[8·5]	9·5	9·9	9·5	9	10	9·8	9	7·9
5.	Second molar, length	9·3	10	9·2	9·2	9	8	...	8	8·5	7·2
	Second molar, breadth	9·2	9·2	9·5	9·8	9	8·5	...	9	8·5	7·2
6.	Third molar, length	...	8·6	8·9	9·1	8·5	8	9	[9]	...	8
	Third molar, breadth	7·6	8·2	8·9	8·6	8·9	8·9	9	[8]	...	6
7.	External incisor, height	...	11	...	...	...	...	12·5			
	External incisor, breadth	...	4·5	...	...	...	...	4·5			
	External incisor, thickness	...	8·6	...	...	...	...	9			

* The numbers correspond with those denoting the skulls in Table 8.

the skulls of *A. edwardsi*, and the facial angle is consequently less steep. The nasals are short and broad (text-fig. 20, B, and Pl. XIX. fig. 3), and the upward extension of the premaxilla has a stout and outwardly curved margin. The nasal orifice has here a wide circular form, differentiating it materially from that observed in all the other skulls of this genus. The postorbital bar is very massive. The external surface is broad and inwardly inclined, so as to form a partial postorbital *cloison* (Pl. XIX. fig. 2). The orbital margin is distinguished from that of *A. edwardsi* by being sharply defined on its upper and outer border; the orbits are thus not only actually smaller, but are more tube-like in form than in either of the other species. The interorbital breadth of the new species is also greater than in either of those previously described.

The incisors are missing, but their alveoli are not far in advance of the anterior margin of the nasals; the muzzle has thus a truncated appearance. This feature, in conjunction with the small frontal convexity and absence of prominent sagittal crest, gives to the skull a very different profile from that of either of the other species (compare text-fig. 23, p. 103, with text-fig. 47, A, p. 151).

Family LEMURIDÆ.

Subfamily MEGALADAPINÆ.

Giant subfossil Lemuroids from Madagascar. Skull long and narrow. Brain-case depressed; brain showing evidence of retrogression. Orbits small and tubular. Muzzle elongated. Zygomata high and strongly developed. Mandible massive.

Dental formula: $\frac{\text{i. 0: c. 1: pm. 3: m. 3}}{\text{i. 2: c. 1: pm. 3: m. 3}}$.

Note.—The Megaladapinæ in many essential features so closely resemble the Lemurinæ that it seems unnecessary to rank them as a separate family.

Genus MEGALADAPIS (Forsyth Major).

Definition.—Gigantic subfossil Lemuroids from Madagascar. Skull long and narrow, with marked postorbital constriction, vertical occiput, and strongly developed sagittal and lambdoidal crests. Facial portion elongated, with great interorbital breadth and large aërial sinuses.

Dental formula: $\frac{\text{i. 0: c. 1: pm. 3: m. 3}}{\text{i. 2: c. 1: pm. 3: m. 3}}$.

Note.—Among the fossils found at Ampasambazimba are several skulls of a new species of *Megaladapis* to which the name of *Megaladapis grandidieri* has been given. Before describing the distinctive features of these skulls it may be useful to recall in some detail the main characteristics of the genus which are common to all the species now known.

All three species agree in having a low flattened brain-case and a long narrow skull. The cerebral convolutions are feebly marked; there is a notable reduction of the frontal lobes; and the hemispheres leave the cerebellum uncovered. The occiput forms a plane at right angles to the axis of the skull and the occipital condyles are vertical. The facial region is greatly developed, large frontal and maxillary sinuses occurring in the adult. The face, indeed, is rather suggestive of a Ruminant than of a Lemur. The lines of attachment of the temporal muscles form a sagittal crest, as in some of the fossil Lemurinæ and Indrisidæ. There are also strong lambdoidal crests continuous with the high zygomatic processes of the squamosal.

One peculiarity in which the Megaladapinæ differ from almost all the recent and fossil Lemuroids is their great interorbital breadth. This breadth may be conveniently expressed in the form of an index, thus: $\frac{\text{interorbital breadth} \times 100}{\text{maximum length of skull}}$.

Measurements taken on a series of Lemuroid skulls, recent and fossil, give the following results:—

	per cent.
Chiromys madagascariensis	31·1
Megaladapis grandidieri	28·2
Indris brevicaudatus	20·8
Propithecus diadema	18·6
Avahis laniger	18
Mesopropithecus pithecoides	17·8
Palæopropithecus maximus	17·3
Lemur jullyi	15·4
Perodicticus potto	14·8
Lemur varius	14·5
Archæolemur edwardsi	13·5
Lepilemur	11·4
Nycticebus	8·5

It is interesting to note that a quite young skull of *Megaladapis grandidieri* has an interorbital index of only 18·1, in this respect ranging itself with the various subdivisions of the Indrisinæ. It is thus evident that the great interorbital breadth of the adult *Megaladapis* is a secondarily acquired character.

The orbits in all three species are small and tubular and are directed outwards, the plane of the orbital rim being nearly vertical. The lacrymal foramen is situated without the orbit or in line with the orbital margin. No postorbital wall occurs, and the hinder edge of the postorbital bar is rounded. The nasalia are strongly developed and at their anterior extremity are (in the two species where this part of the skull is known) prolonged in a downward direction into a curved beak-like form. Auditory bullæ are present, but in none of the species take the prominent inflated form so characteristic of the majority of Lemurs.

The zygomatic arches are high and strong, contrasting with the light thin arcades of existing Lemurs; and they do not curve widely away from the skull, as is the case with *Palæopropithecus* and *Mesopropithecus*.

The postorbital region of the frontal is curiously constricted. This, as we have already had occasion to remark, is a feature recurring in all the subfossil Lemuroids. The frontal region of the brain in the adult *Megaladapis* is itself still further constricted by the presence of large aërial sinuses.

The lower jaw is deep and massive. Its inferior outline forms in all three species a nearly straight line. The mandibular suture is quite obliterated at an early age. The alveolar margin of the molars and premolars is strongly curved upwards anteriorly (text-fig. 24).

The dental formula of *Megaladapis* is $\frac{\text{i. } 0 : \text{c. } 1 : \text{pm. } 3 : \text{m. } 3}{\text{i. } 2 : \text{c. } 1 : \text{pm. } 3 : \text{m. } 3}$, if we adopt the theory that in the lower jaw the canine functions as an incisor and that the apparent canine is a premolar.

This formula, with the exception of the absence of upper incisors, corresponds with the "primitive" Primate formula as found among the modern Lemuridæ and the Cebidæ of the New World. Professor Duckworth states that the upper jaw of *Megaladapis insignis* (= *edwardsi*) carries vestigial incisors. In none of the skulls of *Megaladapis grandidieri* which I have examined is there any trace of these, unless, indeed, some slight depressions in the alveolar margin of one specimen represent the scars where such incisors have fallen.

Dr. Forsyth Major has pointed out the resemblance between the teeth of *Megaladapis* and those of *Adapis magna*. The tritubercular type of molar in the upper jaw is most nearly represented among modern Lemurs by *Lepidolemur* and *Chirogale*. The third molar of the mandible of *Megaladapis* is very strongly developed, having a large talon. In this respect this genus contrasts with other Malagasy fossil Primates and with modern Lemurs, especially the Indrisinæ, where, as we have seen, this tooth tends to disappear.

In all three species of *Megaladapis* there is a diastema between the canine (or apparent canine) and the succeeding premolar in both upper and lower jaws.

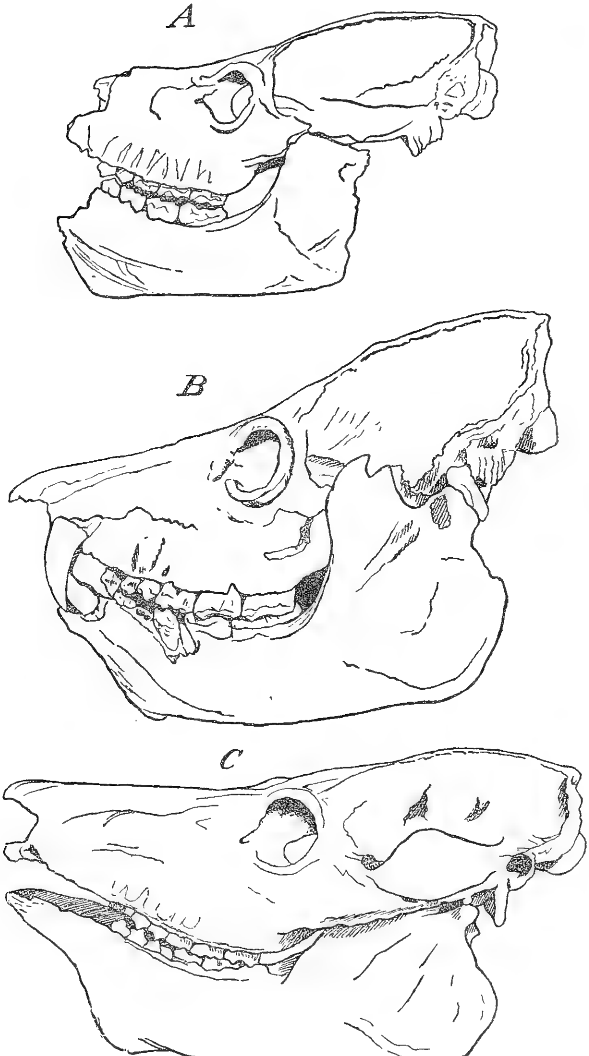
Synonymy.—The existence of remains of extinct Primates in Madagascar was first made known by Dr. Forsyth Major, who, in 1894, published a memoir in the 'Transactions of the Royal Society,' entitled "On *Megaladapis*, an Extinct Gigantic Lemuroid from Ambolisatra." In this memoir a description is given of a skull brought from the south-west of Madagascar by Mr. Last. To this the name *Megaladapis madagascariensis* was given.

In 1899 M. G. Grandidier described and figured in the 'Bulletin du Muséum d'Histoire naturelle de Paris' three teeth of a gigantic Lemuroid on which he founded the genus *Peloriadapis*.

In the following year a description by Dr. Forsyth Major of a fragment of an upper jaw in the British Museum appeared. To this the name of *Megaladapis insignis* was given.

Again, in 1906 a memoir published by Dr. Lorenz v. Liburnau, of Vienna, gives a

Text-fig. 24.



Profiles of three species of *Megaladapis*:—A. *M. madagascariensis*; B. *M. edwardsi*; C. *M. grandidieri*. Drawn to the same scale and about $\frac{2}{5}$ actual size.

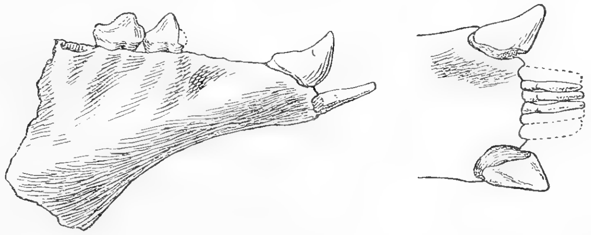
detailed description of several skulls brought to Europe by the collector Sikora. These he refers to the same species as that described by Grandidier in 1899, though he distinguishes two varieties as *Dolichocephalus* and *Brachycephalus*. Dr. Grandidier himself, who has seen the London and Vienna specimens, does not hesitate to refer them all to one species, identical with that first described by himself. He concludes, however, that in view of the complete series the points of distinction differentiating these fossils from *M. madagascariensis* no longer justify the retention of the genus *Peloriadapis*, and he gives the name *M. edwardsi* to all these remains.

MEGALADAPIS GRANDIDIERI (Standing). (Plates XXIV.–XXVI.)

The new species of *Megaladapis* discovered at Ampasambazimba differs in several important particulars from the two species previously known. In size the skull of this new species agrees in general with *Megaladapis edwardsi*, though in certain of its dimensions it surpasses the latter. The maximum length of the skull, measured from the occipital condyle to the anterior border of the nasal bone, is 292 millimetres, this being the average for three perfect skulls, the largest of which, however, measures 312 mm. The average maximum length for four skulls of *M. edwardsi* in the Vienna Museum is 291 mm., though three of the measurements are apparently only approximate estimates owing to the imperfect condition of the skulls.

One of the most striking characters of the new species has already been referred to in the general description of the genus, viz., the great interorbital breadth. In *M. grandidieri* this measurement exceeds by some 30 mm. the corresponding dimensions

Text-fig. 25.



Anterior part of mandible of *Megaladapis grandidieri*, showing spout-like projection carrying procumbent incisors.

of *M. madagascariensis*. The bi-zygomatic breadth slightly exceeds that of *M. edwardsi*. One of the most noticeable features of *M. grandidieri* is the curious lengthening out of the anterior part of the muzzle. Correlated with this is a long diastema of some 30 mm. between the canine and the first premolar in the upper jaw. A similar interval exists in the mandible, the anterior part of which is drawn out into a shallow spout-like extension which carries the first premolars and the procumbent canine and incisors (text-fig. 25).

The median line of the palate forms a double curve, the part between the molars and premolars being convex, while the anterior part is concave, forming an angle of 150° with the posterior part. When the lower jaw is apposed to the upper a wide space is left between the alveolar margin of the premaxillæ and the lower incisors. This feature considered in connexion with the concavity of the palate and the deep trough-like mandible suggests that the animal possessed a thick fleshy tongue.

The teeth of both the upper and lower series bear a strong resemblance both in size and conformation to those of *M. madagascariensis.* The most noticeable difference in size as compared with *M. edwardsi* is seen in the second and third molars. A reference to the appended comparative table showing the dimensions of the teeth of the three species will make this apparent.

TABLE 11.—Giving comparative dimensions of teeth of three species of *Megaladapis.*

	M. madagascariensis.	*M. grandidieri.*	*M. edwardsi.*
UPPER JAW.			
M. 3. Greatest length	17·8	19 (7)	26·6 (5)
,, ,, breadth	14·6	16·3 (7)	22·2 (5)
M. 2. ,, length	17	18·1 (7)	24 (5)
,, ,, breadth	15·8	13·2 (6)	20·8 (5)
M. 1. ,, length	13·5	15·1 (7)	19·3 (3)
,, ,, breadth	12·7	12·8 (7)	16 (2)
P. 3. ,, length	10	10·7 (5)	11·3 (3)
,, ,, breadth	9·7	10·2 (5)	13·3 (3)
P. 2. ,, length	10·3	10·4 (6)	11·8 (4)
,, ,, breadth	8·5	9·3 (6)	10·5 (4)
P. 1. ,, length	..	12·1 (6)	12·3 (4)
,, ,, breadth	..	6·7 (6)	7·8 (4)
LOWER JAW.			
M. 3. Greatest length	23·5	26·1 (8)	37·5 (4)
,, ,, breadth	..	11 (9)	16·5 (4)
M. 2. ,, length	15·5	18·1 (7)	24·8 (3)
,, ,, breadth	..	11·2 (7)	14·7 (3)
M. 1. ,, length	13	14·2 (8)	19 (2)
,, ,, breadth	..	9·3 (8)	12·5 (3)
P. 2. ,, length	..	11·1 (7)	13·9 (2)
,, ,, breadth	..	7·1 (7)	8·7 (2)
P. 1. ,, length	..	10·5 (7)	12
,, ,, breadth	..	6·5 (7)	6·5

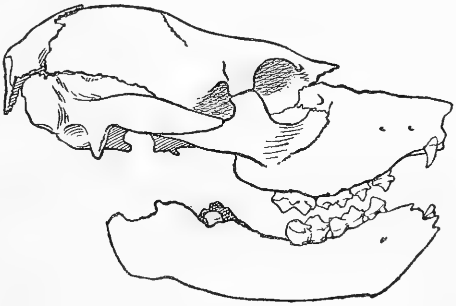
The small figure in parentheses indicates the number of specimens measured.

There are considerable variations in the shape and pattern of the molars. In some specimens the posterior margin of the third molar is nearly straight, the tooth thus having a distinctly triangular form. In other cases this margin shows a distinct tendency to the development of a postero-internal cusp (see Plate XXVI.), thus giving to the tooth an irregular rhomboidal outline. The backward extension of the dental series also varies greatly. In some skulls the centre of the posterior margin of the palate reaches almost to the second molar, while in other specimens the palatal margin is posterior to a line joining the hinder edges of the third molars.

Some of the crania show a curious lateral torsion of the long axis, the facial portion being deflected to the extent of several millimetres from a line bisecting the posterior part. This peculiarity is well seen in the skull figured on Plate XXVI.

In his memoir on *Megaladapis madagascariensis* Forsyth Major says, "it is to be anticipated that skulls of young specimens will bear a much closer resemblance than the adult to the existing Lemuridæ"; and he instances several particulars in which this will probably be the case, viz., a more rounded cranium, a brain-cavity relatively and possibly absolutely larger than in the adult, a relatively shorter facial portion, and

Text-fig. 26.



Profile of cranium and mandible of young specimen of *Megaladapis grandidieri*. $\times \frac{1}{2}$.

the absence of postorbital prolongation of the frontals. He also anticipates that the constriction of the olfactory fossa, due to the development of aërial sinuses (so marked a feature of the adult) will be wanting in the young animal.

The occurrence of a quite young specimen of *Megaladapis grandidieri* among the fossils exhumed at Ampasambazimba makes it possible to test the validity of these forecasts. In the skull in question the permanent canine and the second molar have not yet appeared below the alveolar margin, but are visible deep in their sockets.

A reference to the figure of this skull (text-fig. 26) will show that in its general aspect it conforms much more nearly to the type of modern Lemurs than is the case with the adult. The brain-case is rounded and relatively much more voluminous.

The maximum breadth in the case of the young animal is approximately one-third of the maximum length of the skull, while in the adult it falls short of one-fourth. The face, as might be anticipated, is of relatively small dimensions in the younger skull, the nasals only occupying about 31 per cent. of the superior contour of the skull, as compared with 41·5 per cent. in the full-grown animal; the lengthening out of the maxilla as adult age is reached occurs at both ends of the dental series. At the posterior end space has to be found for the permanent molars, while at the anterior portion the diastema between the first premolar and the canine, which in the young specimen under consideration measures 15 mm., increases to double that length as growth advances.

Text-fig. 27.

Restoration of skull and mandible of *Megaladapis grandidieri*. $\times \frac{1}{2}$.

As already stated, the olfactory fossa of the Megaladapinæ is greatly constricted by the lateral development of aërial sinuses. This effect extends to the cerebral fossa itself with an accompanying reduction of substance of the frontal lobes. This constriction is already visible in the immature skull, though it is not yet advanced to the extent noticed in the adult. The backward lateral extension of the frontal and the upward extension of the squamosal are not appreciably different from the condition of these bones in the fully developed skull. There is, as might be expected, a total absence of crests; the two superior lines of attachment of the temporal muscles occupy the position seen in recent Indrisinæ. The frontal suture can still be traced, though already fused, and the interorbital convexity is almost as prominent as in the adult. In spite of the relatively smaller interorbital breadth already noticed, the orbits are directed more outwardly and upwardly than in full-grown specimens, and are relatively larger in the young skull. An index showing the vertical orbital diameter as compared with the maximum length of the skull gives, in the case of the young animal, 16·4 per cent. This feature again brings it nearer to the recent Lemurs. The contour and proportions of the supraoccipital bone very closely resemble the condition seen in recent Indrisinæ.

An almost perfect mandible was found accompanying the skull, and in this, again, there are certain features of interest. The symphysis is already firmly fused, with hardly a trace of the suture. The anterior part of the mandible, although sloping forward considerably, does not yet show the strange spout-like prolongation so characteristic of this species of *Megaladapis*. A milk-incisor is still present, and occupies a less procumbent position than do the incisors of the full-grown animal. Its form does not at all recall the incisors of the adult, being flattened in a direction

TABLE 12.—Showing dimensions of the skull in the three species of *Megaladapis*.

	M. grandidieri.	*M. edwardsi.*	*M. madagascariensis.*
SKULL.	mm.	mm.	mm.
From inferior border of foramen magnum to anterior margin of premaxillæ	266	230	215
Maximum length of skull	292	288	?
From anterior margin of orbit to upper border of foramen magnum	168	156	142
From posterior border of palate to anterior margin of premaxillæ	130	92	?
Total length of dental series	137	126	?
Length of series of molars and premolars	82	94	75
Diameter of orbits	33	36	26
Maximum height of skull with jaw in position	173	192	?
,, vertical height of brain-case	67	89	68
,, bi-zygomatic breadth	127	150	100
,, external breadth of brain-case	70	57	58
Transverse diameter of foramen magnum	26	18	17
Vertical diameter of foramen magnum	24	25	20
Maximum breadth of skull between middle of orbits	135	110	111
Distance between lacrymal foramina	70	67	63
Breadth of palate between postero-external angles of third molars	69	..	56
Angle of intersection of planes through orbital margins	90°	70°	100°
MANDIBLE.			
Distance from condyle to summit of symphysis	230	192	?
Height of symphysis	86	70	..
Length of series of three molars	58	80	53

at right angles to the alveolar margin. A diastema of 9 mm. has existed between the first (apparent) milk-premolar and the milk-canine. The lower profile of the mandible is not straight, but shows a gently convex curvature.

Appendicular Skeleton.—The humerus of *M. edwardsi* has been found, as also that of *M. madagascariensis.* A fragmentary ulna and a femur of the larger animal are figured by Lorenz in his recently published memoir. The resemblance of the humerus to that of the Anthropoid Apes is noted by Dr. Grandidier, though he attributes the similarities to mere convergence. Of *Megaladapis grandidieri* a considerable number of humeri and radii and one imperfect ulna have been discovered along with several metacarpals and phalanges. But a discussion of the significance of the characters of the appendicular skeleton of *Megaladapis* is deferred to a later section.

TABLE 13.—Giving dimensions of five skulls of *Megaladapis grandidieri.*

		1.	2.	3.	4.	5.
		mm.	mm.	mm.	mm.	mm.
1.	From lower margin of foramen magnum to alveolar border of premaxillæ	276	241	..	..	280
2.	Maximum length of skull	295	268	..	..	312
3.	From lower margin of orbit to upper margin of foramen magnum	171	163	..	..	172
4.	From lambdoidal crest to fronto-nasal suture	172	157	..	..	205
5.	Length of palate along median line	131	[106]	127·5	..	139
6.	From lower margin of foramen magnum to posterior edge of palate	153	145	..	..	158
7.	From lower margin of orbit to alveolar border of premaxillæ	130·5	[103·5]	125	[120]	133·5
8.	Length of series of molars and premolars	76·1	81	78·2	78·2	87
9.	From anterior surface of postglenoid process to posterior edge of third molar	116	98·5	..	..	[116·5]
10.	Vertical diameter of orbits	35	33	34	31·2	32·5
11.	Transverse diameter of orbits	35	32·8	32	31·8	33
12.	Maximum external height of brain-case	69	64	..	..	66·5
13.	Bi-zygomatic breadth (external)	127	123	..	..	132
14.	Maximum external breadth of brain-case	68	70·5	..	..	72
15.	Breadth between styloid processes	[66]	71	..	..	[65]
16.	Transverse diameter of foramen magnum	27	26·5	..	..	25
17.	Vertical diameter of foramen magnum	25	24	..	..	25
18.	Distance between orifices of auditory meatus	78	78	..	..	75
19.	Breadth of skull at level of orbits	32·5	34	35	..	38
20.	Breadth between lacrymal foramina	71	59	76	66·5	80
21.	Breadth of palate between third molars (internal)	39·8	38	41·8	40·8	38
22.	Breadth of palate between antero-internal margin of canines	..	..	..	..	46
23.	Maximum breadth of nasalia	31·5	..	29·2	28·2	[36]
24.	Minimum breadth of nasalia	21·8	..	18	17·5	22
25.	Maximum width (height) of zygomatic arch	34·5	31·2			

TABLE 14.—Giving dimensions (in millimetres) of mandible of *Megaladapis grandidieri*.

		1.	2.	3.
1.	From condyle to tips of incisors	[235]	[243]	
2.	From condyle to summit of symphysis	227	234	
3.	From lower end of symphysis to a line joining inferior angles	182	180	
4.	From coronoid process to inferior angles	108·5		
5.	Maximum distance from condyle to inferior angle	87	87	
6.	Length of series of molars and premolars	84·5	74·2	82·5
7.	From posterior edge of last molar to postero-inferior angle	108	121	
8.	From condyle to posterior edge of last molar	101	111	
9.	Length of symphysis	86	88·5	
10.	Distance between coronoid processes	[52]		
11.	Distance between condyles	..	50	
12.	Distance between inferior angles	..	97	
13.	Breadth between rami behind third molars	34	41	
14.	Space occupied by dental series from median incisor to third molar	61	54·5	59
15.	Space occupied by two premolars	23·5	20	23·5
16.	Thickness of jaw at level of first molar	10	11·2	9·5
17.	Height of jaw at level of first molar (including tooth)	62·5	60	[50]

Subfamily LEMURINÆ.

Genus LEMUR.

Of the existing Malagasy Lemuroids (if we exclude the aberrant *Chiromys*) the members of the genus *Lemur* bear the least resemblance to the higher Primates. At the same time their affinities with the scattered members of the family of Lemuridæ in the continental areas of the Old World are obvious. Many of these sporadic genera of Lemuridæ show evidence of *specialisation.* As illustrating this statement reference may be made to *Loris, Nycticebus,* and *Tarsius.* How far the similarities between the various genera are the result of convergence or specialisation along similar lines due to similar habits and conditions, it would be difficult at present to determine. There is evidence in the case of the Indrisine group of a strong tendency to the production of some of the distinctly "Lemuroid" features among the surviving members of a family whose extinct representatives were evidently descended from ancestral forms with strong Simian affinities, if not, indeed, from progenitors which can only be described as Apes.

A comparison of *Indris, Propithecus,* and *Avahis* with such forms as *Archæolemur* and *Hadropithecus* leads to the belief that the long muzzle, flattened brain-case, weak upper incisors, and frail mandible are in the case of the extant genera secondarily acquired. Although in the case of the Lemurinæ the evidence is as yet incomplete, no

TABLE 15.—Giving dimensions (in millimetres) of teeth of *Megaladapis grandidieri*.

A.—MAXILLA.

		1.	2.	3.	4.	5.	6.	7.
1.	Height of canine	...	...	...	...	32	25	
2.	Breadth of canine	[15·7]	[16·8]	[16]	[19·5]	16·7	14	25
3.	Total length of molars	46	52·9	[50·8]	50	53·5	54	53
4.	First premolar, length (ant.-post.)	[11·5]	12·5	...	[8·8]	14	12·5	13·5
	First premolar, breadth (transverse)	[6·2]	6	...	[6·2]	6·8	8	7
5.	Second premolar, length (ant.-post.)	9·8	10·8	...	10·2	10	9·5	12
	Second premolar, breadth (transverse)	8·3	9·2	...	8·7	10	9·5	10
6.	Third premolar, length (ant.-post.)	9·5	11·2	...	10·8	11	...	11
	Third premolar, breadth (transverse)	9·2	10·2	...	9·5	11	...	11
7.	First molar, length	13·5	15·1	[17]	15·2	14·5	15·2	15
	First molar, breadth	12·5	13	[11·2]	13·2	13·8	15	12
8.	Second molar, length	16·7	18·8	17	18·2	18·8	18·5	19
	Second molar, breadth	14·7	16	16·8	14·9	17·5	18	17
9.	Third molar, length	17	19·8	19·5	17·8	19·8	19	20
	Third molar, breadth	14·2	17	16·5	14·8	16·9	16·5	18
10.	Total length of premolars	[33·2]	31·5	...	[30]	35·3	...	33

B.—MANDIBLE.

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1.	Height of caniniform premolar	...	...	...	...	...	...	12	...	...	...	...	17·5				
2.	Breadth of caniniform premolar	...	...	...	...	...	...	14	...	...	...	...	14				
3.	Second premolar, length	9	...	10	...	...	...	10·2	11	9·5	11	11	9·2	10	...	11·5	
	Second premolar, breadth	9	...	9·5	...	...	...	10	7	5·5	7	6	7	6·2	...	6·5	
4.	Third premolar, length	10·9	10·2	10	10·5	10·9	11·5	10	12·5	10·5	12·5	11	8·7	11	12	11·5	12
	Third premolar, breadth	11	10·5	10·5	10	9·9	10·5	10	7	6	8	6·5	8	7	7·5	7·8	7·3
5.	First molar, length	14·8	14	14	15	15	11·5	15	14	13	15·2	14	...	14·2	15·2	14·2	15
	First molar, breadth	13	13·5	14	18	13·5	11	13·5	9	8·5	10	9	...	9·5	10	9·2	9
6.	Second molar, length	18	17	16·5	17·5	17	14·5	19	18	16·5	19·2	18	...	17·2	19	19·8	18
	Second molar, breadth	16	17	16	15	16	14	16·5	11·2	10·5	12·5	10·5	...	11·5	12	10·9	11·2
7.	Third molar, length	19	18	18	18·2	18	18·5	19·5	29	15	24·6	25	...	26·5	27	10	27
	Third molar, breadth	17	17	17	15·7	16	16·5	16	11·5	10·5	11	10	...	11	11·5	10·5	10·5

fossil forms having come to light, as in the case of the Indrisinæ, proving conclusively that the existing genera are allied to obviously pithecoid forms *, still even in their case analogy would suggest that they also are descended from Ape-like ancestors. The undoubted degeneracy of the allied Megaladapinæ and the fact that certain members both of Malagasy and continental genera appear to retain Simian characteristics which have disappeared in the Lemurs properly so called (*e. g.*, the postorbital septum of *Tarsius*, the shorter muzzle of *Hapalemur*, the proportionately larger incisors of *Perodicticus* and *Nycticebus*), would suggest that in the case of the Lemurs also many of the so-called "Lemuroid" characters may be the result of convergent specialisation.

Dr. Elliot Smith informs me that the histology of the brain-cortex of certain of the Lemuridæ supplies a complete link with some of the South-American forms, while "the furrow-pattern of *Perodicticus* is an almost exact copy of that of *Pithecia*." There is thus a strong presumption that the various genera of the Lemuridæ as well as the New World Monkeys have had a common origin; that, in fact, the Lemuridæ are, in general, specialised and more or less degenerate decendants of ancestors more Simian in character. This subject will be further discussed in the concluding sections.

In the Ampasambazimba deposit eleven perfect or almost perfect skulls of *Lemur* have been discovered. These are evidently closely allied to the species described by Dr. Filhol from Belo and named by him *L. insignis*. I have given in the 'Bulletin de l'Académie Malgache' my reasons for differentiating the two specimens there briefly described from *L. insignis*. In view of the complete series of skulls, one of the characters on which I based my distinction—viz. the differences in the line of the facial profile—has less weight than I at first attributed to it, since considerable variation occurs in this respect throughout the series.

The broad oval shape of the palate of *L. insignis*, however, especially in the region of the premolars, is not reproduced in any of the new specimens—the anterior part of the palate in all of them showing more resemblance to the narrow elongated form seen in existing genera than to the broad comparatively ovoid form of *L. insignis*. But since the variations of form among the specimens found at Ampasambazimba are very considerable, I do not feel it safe to speak too dogmatically as to the value of the specific distinctions made among such a series of skulls all obviously closely allied, especially in view of the great variations which we have seen to exist in the case of the subfossil genera already described. The same remark will apply to the specific distinction which I make in the case of one of this series of skulls, in which the occurrence of certain distinctive characters appears to justify a separate notice. For this latter skull I propose the name of *Lemur majori*.

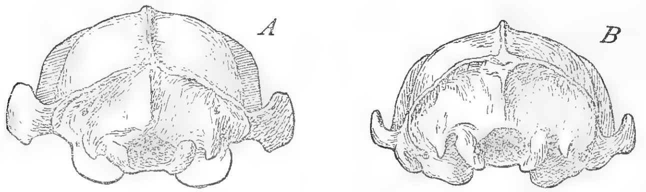
* The evident resemblance of the humerus of *Lemur jullyi* to that of *Archæolemur* referred to in the following section goes far towards furnishing such evidence, as also do certain characters of the skull of *Lemur jullyi* to which attention is called in the present section.

LEMUR JULLYI (Standing).

Description of Skull of L. jullyi. (Plate XXVII.)

Nine of the eleven skulls of *Lemur* in the collection of the Académie Malgache form a series which, while presenting many individual variations, can best be described under one specific name. One of this series I have already figured and briefly described under the name *L. jullyi.* A lengthy description of this species is not necessary for my present purpose, the series of photographs given on Pl. XXVII. with the table of dimensions at the end of the present section will sufficiently indicate its main features. The existing species which comes nearest to this subfossil form is *L. varius*, and the species, as already pointed out in my preliminary notice, is intermediate between

Text-fig. 28.



Occiputs of (A) *Mesopropithecus pithecoides* and (B) *Lemur jullyi*, compared.

L. insignis and *L. varius.* A comparison with the latter shows it to be larger and more massive in every way. Nearly all the full-grown specimens possess powerful ridges and crests, the sagittal and lambdoidal being specially prominent.

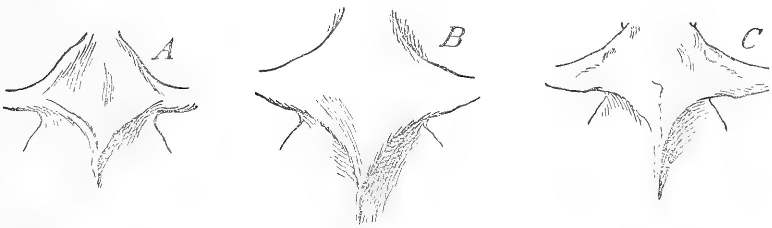
Occipital Region.—The condyles are much broader than in the extant species, a line of chief convexity running obliquely outwards and upwards and separating two distinct planes of contact with the atlas, an upper posterior and lower antero-external one, in a manner closely analogous to that seen in *Mesopropithecus* and *Archæolemur.* The plane of the occiput is much larger than in the recent species, though this condition is partly due to the prominence of the lambdoidal crest already alluded to. The paroccipital processes are large and prominent (text-fig. 28).

Parietal and Frontal Regions.—The brain-case is pear-shaped, presenting in every case the curious frontal constriction which we have seen to be so marked a feature of the Malagasy subfossil Lemuroids. The supraorbital frontal ridges are prominent, though slightly less so than in adult specimens of *L. varius.* The central frontal region differs greatly in appearance, however, from the corresponding part of *L. varius*, owing to the fact that the sagittal crest divides at or near the coronal suture and is continued by two prominent diverging ridges which are confluent with the outer posterior edge of the postorbital bar. These anterior and posterior paired ridges thus enclose a diamond-shaped more or less flattened region similar to that observed in *Megaladapis*, and evidently analogous to the raised frontal region existing in *Archæolemur* and *Mesopropithecus* (text-fig. 29).

Nasal Region.—The facial profile varies much in different specimens, in some cases being decidedly steeper than in others. In the type specimen of *L. jullyi* the profile forms a nearly straight line from the coronal suture to the tip of the nasals. In others the median suture of the nasals forms a concave curve.

The distance between the inner pair of incisors is longer than in the case of *L. varius*, and these appear to have been functionally less important than in the recent species. The position of the alveoli shows a close resemblance to the condition of *L. insignis.*

Text-fig. 29.



Vertex view of raised frontal area of : (A) *Mesopropithecus pithecoides*, (B) *Archæolemur edwardsi*, and (C) *Lemur jullyi*.

The Orbital Region.—The postorbital bar is triangular in section. The posterior surface is of variable breadth (in some cases its upper portion exceeding 5 mm.), and shows the sharp inner edge which has been referred to in the case of *Mesopropithecus*, *Palæopropithecus*, and *Archæolemur*. The resemblance between this region and the corresponding part of *Mesopropithecus* appears too striking to be due to mere convergence.

Temporal Region.—The strong and massive character of the fossil is especially apparent in the zygomatic arch, which is much higher and stouter than in any extant Lemur. The base of the zygomatic process of the squamosal is especially broad and strong, in this again resembling all the forms previously described.

Dentition.—The description given of the dentition of the type specimen of *L. jullyi* in my preliminary notice of this species will apply with hardly any modification to all the specimens examined. The internal collar of the third molar is in some cases rather more perfectly developed than in the skull originally figured in the 'Bulletin' of the Académie Malgache, thus bringing it slightly nearer to the condition of *L. insignis*. It should also be here remarked that the imperfect skull described as *L. maziensis* must, in view of the complete series now available for comparison, be classed with the species now described.

The fact that the mandible of these extinct Lemurs was much more massive than that of any of the existing species must be correlated with the more massive teeth, strong sagittal crest, and probably also the narrow postorbital frontal region, which we have seen to be invariable features of all the extinct Lemuroids hitherto described.

Lemur majori (Standing). (Plate XXVIII.)

One of the series of skulls of the genus *Lemur* referred to above is distinguished from all the others by the possession of several characters, no one of which alone perhaps would constitute specific distinction, though the simultaneous occurrence of these comparatively numerous variations in one specimen would seem to justify its reference to a distinct species. It will not be necessary after the description given above of *L. jullyi* to do more in the present case than point out where this new species differs from the former.

We may notice first the very voluminous brain-case. Dr. Elliot Smith, who has examined a cast of the cranial cavity of this specimen, estimates the weight of its brain when living at 65 grammes as compared with 33 grammes, the average weight of three specimens of the brain of *L. varius*. This figure differentiates it from all the other specimens in the collection of the Académie, with the possible exception of one skull. As the teeth of this last specimen are all missing, it is not possible to be certain of its exact position. A second striking feature as compared with the cranium of *L. jullyi* and also that of *L. insignis* is the entire absence of crests. That this feature is not due to immaturity is evident from the worn condition of the molars. The large size of the canines would, moreover, indicate that the individual was a male, so that the absence of crests is not merely a sexual variation.

Not only is there no sagittal crest, but the two superior edges of the area covered by the temporal muscles do not quite meet along the sagittal suture. This is in striking contrast with the skulls of *L. jullyi*, where this crest is frequently very prominent and much roughened. Apart from this absence of crests the general contour of the skull is not strikingly different from that of *L. jullyi*, though its greater size is apparent.

Turning to the dentition three peculiarities are observable. The third premolar differs from the corresponding tooth of *L. jullyi* by the possession of a well-developed internal collar similar to and almost as strongly marked as that seen in the first and second molars. The second molar, which in all the specimens of *L. jullyi* has a large antero-external projection overlapping the first molar, is in *L. majori* entirely destitute of this blade-like projection, the tooth presenting the appearance of having had this prominent corner completely filed away. A third feature, which though perhaps hardly by itself of classificatory value, is the fact that the whole series of molars and premolars shows an entire absence of that close overlapping of each tooth by its successor which is a marked character both of *L. insignis* and *L. jullyi*. The shape of the palate is intermediate between that of the two species just named.

The appended tables giving the principal dimensions of the whole series of skulls will in conjunction with the photographic reproductions on Plates XXVII. and XXVIII. preclude the necessity of further detailed description.

Table 16.—Giving dimensions (in millimetres) of ten skulls of *Lemur jullyi* [Nos. 1–6 & 8–11] and one skull of *Lemur majori* [No. 7].

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	From lower margin of foramen magnum to alveolar border of premaxillæ	110	100	[107]	104	110	109	104·5	108	101·5	109·5	105
2.	Maximum length of skull	124	118	124	119·5	126	122	118	125	[114·5]	125·2	125
3.	From lower margin of orbit to upper margin of foramen magnum	77·5	..	[80]	[77]	80	80	76	77	77	[80]	[80]
4.	From lambdoidal crest to fronto-nasal suture	87	83	86	83	83	83	81	83	82·8	87	85
5.	Length of palate along median line	55	..	56·5	56·5	53	51·5	51·5	53	[51]	56	51
6.	From lower margin of foramen magnum to posterior edge of palate	55·5	..	[55]	52·5	57	58	53	55·5	56·5	54	54·2
7.	From lower margin of orbit to alveolar border of premaxillæ	48·5	..	47	43·5	46·5	45·1	46	49	[44]	[46]	45
8.	Length of series of molars and premolars	42	..	40	41·5	40·8	[40]	40	41·2	40·8	[42]	41
9.	From anterior surface of postglenoid process to posterior edge of third molar	34·5	..	35·2	34	38	[37]	34·2	34·6	35·5	[36]	35·5
10.	Vertical diameter of orbits	21·5	..	23·5	22·8	22·8	22	21	22	21·5	22·2	22
11.	Transverse diameter of orbits	22·5	..	25·1	24·5	23·5	23·8	24	24	23	23·5	25
12.	Maximum external height of brain-case	39	40	39·5	39·5	42·7	37·5	39	41·5	39·5	42·5	42·5
13.	Bi-zygomatic breadth (external)	68·5	..	..	..	[78·2]	..	..	[78·2]	[68·4]	82	[79·6]
14.	Maximum external breadth of brain-case	49·5	51	[46]	47·5	50	48·5	48·5	47·5	49	56	55·6
15.	Breadth between styloid processes	32	27	..	29	29·5	30·5	30	30	31	32·5	32
16.	Transverse diameter of foramen magnum	15	14	..	15	15	15·5	15·5	15·2	15·1	17	17
17.	Vertical diameter of foramen magnum	13	15	..	..	13·5	14·2	15·2	15·2	14·8	14·2	[15]
18.	Distance between orifices of auditory meatus	46	47	..	46	46·2	46	45·5	42·2	47·5	52	[45·5]
19.	Breadth of skull at level of postorbital constriction	27·5	31·2	28	28	29	24·2	28	27·9	30·8	30·7	31·5
20.	Breadth between lacrymal foramina	23·5	[22·5]	24	..	23·2	23·5	21·5	25·5	23·9	[23]	22·9
21.	Breadth of palate between third molars (internal)	20·5	..	20	22	21	19·5	19·5	22	20	24	20
22.	Breadth of palate between antero-internal margins of canines	12	11	9·5	8	9·5	8	9	9	..	10	10
23.	Maximum length of nasalia	33·5	32	36	[34]	32	34	31	37	29	34	36
24.	Maximum breadth of nasalia	9	11	10	8·5	11	10	9·5	10	9·5	13	12
25.	Minimum breadth of nasalia	7	8	8·5	[8]	8	7·5	7·5	8·5	8	[8·5]	8

TABLE 17.—Giving dimensions (in millimetres) of thirteen mandibles of *Lemur*.

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	From condyle to summit of symphysis	87	88	87	[95]	[90]	[88·5]	..	..	[87]	..	..	[67·2]	[88]
2.	From lower end of symphysis to a line joining inferior angles	76	76·5	71·2	78	73	76·5	..	..	77	..	..	[54]	
3.	From coronoid process to inferior angles	42·5	44	[44]	52	43·5	..	..	[32·5]	..	[31]	..	[29]	[41]
4.	Maximum distance from condyle to inferior angle	27·5	28·2	[27]	[32]	27·2	30	..	..	28	..	..	[20]	[27·5]
5.	Length of series of molars and premolars	32·5	..	37	[38·5]	[40·5]	[41]	40	..	..	..	39·5		
6.	From posterior edge of last molar to postero-inferior angle	43·5	38·2	39	[40]	37·2	[36]	..	..	36·8	[27]	[21]	..	[31]
7.	From condyle to posterior edge of last molar .	41·5	35	35	39·5	34	[36]	..	..	34·5	..	..	..	35
8.	Length of symphysis	[19]	[18·5]	[18]	[20]	[18·5]	[18]	18	[18]	17·5	[20·2]	16·5	15	14·5
9.	Distance between coronoid processes	..	38											
10.	Distance between condyles	..	22·5											
11.	Distance between inferior angles	..	31·5											
12.	Distance between rami behind third molars..	..	20											
13.	Length of three molars	25·5	23	23·1	24	25·5	..	25·5	..	..	..	25		
14.	Space occupied by two premolars	7·2	..	14	[15]	[15·5]	..	14·5	..	..	..	14·5		
15.	Thickness of jaw at level of first molar	5·2	5·5	6	6·5	5·5	6·2	6	6·2	6·2	6·2	6	5·5	6
16.	Height of jaw at level of first molar (including tooth)	18·5	17·5	20	20·5	18·5	..	17	..	..	..	18·2	14·2	

TABLE 18.—Giving dimensions (in millimetres) of teeth of *Lemur jullyi* and *Lemur majori* [No. 7].

A.—MAXILLA.

		1.	3.	4.	5.	7.	8.	11.*
1.	Height of canine	..	..	..	..	..	13	16
2.	Breadth of canine (ant.-post.)	..	..	..	..	..	10	9·5
3.	Total length of molars	22·8	22·2	[21·2]	21·8	[21]	20·5	20·8
4.	First premolar { length (ant.-post.)	[6·2]	5·8	6·8	6	[6·5]	[6]	[6·3]
	breadth (transverse)	[4·2]	2·9	3·3	3·8	[3·8]	[4·2]	[4·5]
5.	Second premolar { length (ant.-post.)	7·5	7·8	8	7·8	8	7·8	6·7
	breadth (transverse)	6·2	6·5	6	5·5	6·2	6	6·5
6.	Third premolar { length (ant.-post.)	7·8	7·7	7·8	7·7	[7·8]	7·9	8
	breadth (transverse)	8	8·2	5·2	7·8	[7·8]	7·5	8·9
7.	First molar { length	9	8·7	[8]	8·8	8·5	[7·8]	7
	breadth	9·7	9·2	[9·8]	9·1	9·5	[8·7]	9·5
8.	Second molar { length	7·8	7·7	8	7·8	7·8	7	7·5
	breadth	9·7	8·9	9·9	9	9·2	9·5	9·9
9.	Third molar { length	7	6·8	7	6·8	[6]	6	6·8
	breadth	7	6·8	7·2	7	[6·5]	6·5	6·9

B.—MANDIBLE.

		1.	2.	3.	4.	5.	6.	7.
1.	Height of canine	..	..	..	..	..	7·5	8·5
2.	Breadth of canine	..	..	..	..	..	8	7·5
3.	Second premolar { length	7·2	..	5·5	..	8	7	6·5
	breadth	4·2	..	4	..	5·5	4·5	4
4.	Third premolar { length	..	..	8	8	...	8	8·2
	breadth	..	..	5	5·2	..	8·5	5
5.	First molar { length	8·5	8·5	8·5	9	9	9	9
	breadth	5·2	5·5	5·2	6	6	6	6·8
6.	Second molar { length	9·5	7·2	8·2	8·9	8·5	8·5	8
	breadth	5·9	6	5·5	6	6	6	5·5
7.	Third molar { length	8	7·2	6·5	7·9	8	8	8
	breadth	6	5	4·5	5	5	5	4·8

* These numbers correspond to skulls in Table 16.

THE APPENDICULAR SKELETON.

Fully to describe and discuss the fine series of limb-bones and pelves which have been found at Ampasambazimba would require much more time and space than is now at my disposal. It will be useful, however, by way of forming a basis for future comparison, to give detailed measurements of the greater number of these specimens, and at the same time to call attention to some of the most striking and interesting of them, and very briefly to discuss the affinities of such as appear to throw further light on the problems discussed in the present memoir.

One preliminary remark must, however, be made. It was stated in the introductory section that no single skeleton has been found complete in the fossil-diggings at Ampasambazimba, but that the bones are in general scattered without order or connection. This fact makes the task of identification and description specially difficult, and I wish it to be understood that I do not regard all the determinations here made as absolute. They must be subject to revision as the material for a more complete comparative study is accumulated.

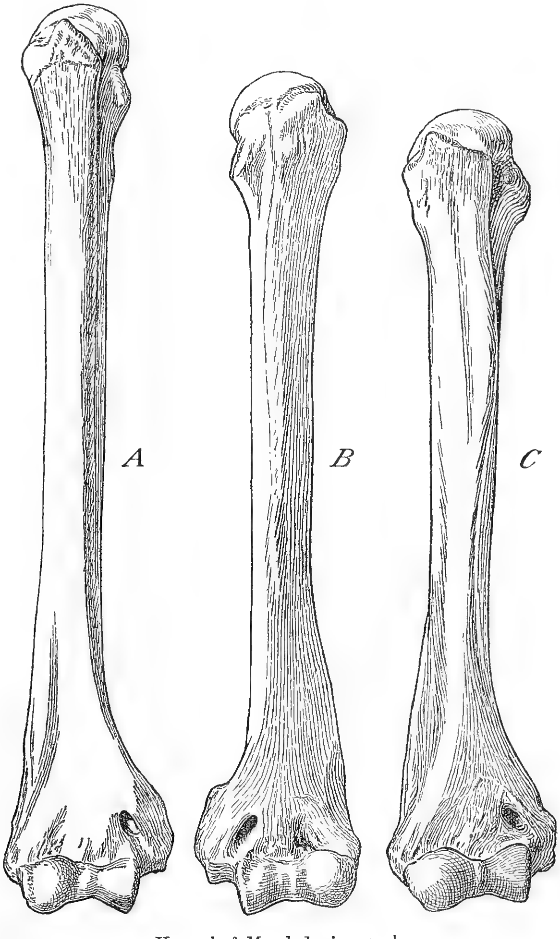
In several cases, however, analogy with extant forms and the relations already proved to exist among the subfossil Lemuroids whose skulls have been described will form a valuable guide, while inferences as to the probable mode of life of certain of the peculiarly specialised genera will furnish further indications.

THE HUMERUS.

Megaladapis.—Seven perfect humeri which must be referred to the genus *Megaladapis* have been found. The dimensions of these are given in Table 19, Nos. **1–7** (p. 132) (three are shown in text-fig. 30). A comparison of the various details of this series of bones will show how greatly they differ in some of their principal dimensions. Thus the humerus figured as No. **4** in the table (C in text-fig. 30) is shorter by 4 cm. than No. **1**. That this is not a mere sexual difference is shown by the fact that the shorter bone is much the more robust of the two. Had these two bones alone been found I should not have hesitated to refer them to two distinct species, and, indeed, it is quite possible that the smaller bone may be the humerus of *M. madagascariensis*; but in view of the fact that several humeri occur of intermediate length, and one even still shorter, it seems better for the present not to refer these bones to several new species but to wait for a fuller knowledge of other parts of the skeleton.

The general features of the humerus of *Megaladapis* are already known. The long straight cylindrical shaft, the large rounded head, the broad distal end, the disposition of the tuberosities, the clearly marked bicipital groove, strongly recall the human humerus. We shall presently see that the ulna of *Megaladapis* also has certain features resembling the condition observed in Man and the higher Apes rather than the ordinary "Lemuroid" type. Dr. Grandidier regards these Simian resemblances merely as secondarily acquired through the adoption of a similar mode of life. This assumption, of course, implies that the arm-bones of the ancestors of *Megaladapis* had characteristic "Lemuroid" features which have since been lost. That such may have

Text-fig. 30.



Humeri of *Megaladapis*. $\times \frac{1}{2}$.

been the case is indeed possible, but seems an unnecessary assumption. To take one instance: the characteristic curvature of the humerus of the true Lemurs appears to me much more likely to be secondarily acquired, depending on the peculiar use of the fore limbs necessitated by the disproportionately long legs of the extant members of the genus. That their curvature is not a primitive character seems the more probable since it is hardly noticeable in *Archæolemur*, *Mesopropithecus*, *Palæopropithecus*, or indeed in the recent Indrisinæ.

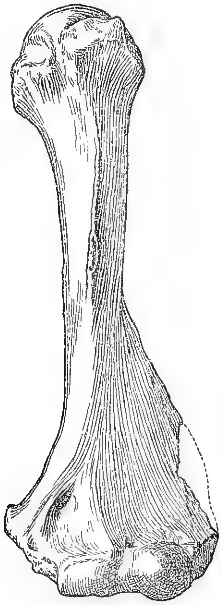
It is interesting to observe that, although some of the characteristic features of the humerus of the genus *Lemur* are absent in that of *Megaladapis*, the affinities are nevertheless rather with the Lemurinæ than with the Indrisinæ. The size, shape, and position of the lesser tuberosity, the form of the trochlear and capitular surfaces, the curvature of the broad flange running down to the external epicondyle—these and other features confirm the evidence already afforded by the skull that *Megaladapis* belongs rather to the Lemurine than to the Indrisine group of Malagasy Lemuroids.

Dr. Lorenz suggests that the *Megaladapis* was probably arboreal in its habits, clinging to the trunks of trees and crawling along the branches. It hardly seems to me likely that so large and massive an animal, as its skull and limb-bones show it to have been, could in this manner conveniently reach either the leaves or fruits of forest-trees. Its very massive jaws and strong cusped teeth seem, however, to be adapted for feeding on the large hard fruits which occur abundantly in the forest débris at Ampasambazimba. But fruits are found on the ground in profusion at certain seasons in the Malagasy forests; at the same time its long arms would enable it to hang on to the branches of trees, serving in fact the same purpose as those of the Gorilla and Chimpanzee.

Palæopropithecus.—One nearly perfect and two fragmentary humeri (the former marked No. **9** in Table 19) must be referred to *Palæopropithecus* (text-fig. 31). This bone is of great interest when considered in connection with the supposed mode of life of the animal. We have seen reason for suspecting that *Palæopropithecus* was aquatic, and several features of the humerus under consideration appear to confirm that view. The bone is very short and massive, as the annexed figure will show. The ridges and surfaces for muscular attachment are large and prominent, and the distal end is of extraordinary breadth. The very large roughened entepicondyle indicates the possession of powerful flexor muscles of the hand. Of its affinity with the Indrisinæ there is strong evidence: the very prominent deltoid ridge with clearly marked surface of attachment for the great pectoral and deltoid muscles, the prominent backwardly curving internal epicondyle retracted from the articular surface, the regular cylindrical form of the trochlear surface—these and other features show its family-connection with the recent Indrisinæ. One peculiarity of this humerus is worthy of notice as bearing on the mode of life of the animal. The limited extent of the spherical surface for the articulation of the head of the radius shows that quite full extension of the forearm has been impossible. This condition might well be due to the fact that the fore-limb was probably mainly used in swimming.

Archæolemur.—The bones marked **10** to **14** of Table 19 all appear to be referable to the genus *Archæolemur*. In view of the extraordinary diversity which we have seen in the skulls of this genus, it is not surprising that there should be considerable variations in the size of these bones. Without attempting to determine with any certainty the various species to which these humeri should severally be referred, it seems probable that the long, somewhat slender one numbered **13** may be the humerus of *Archæolemur edwardsi*, the somewhat shorter and stouter ones (**11** and **12**) those of *A. platyrrhinus*; while the one indicated in the table as **14**, which though

Text-fig. 31.



Humerus of *Palæopropithecus maximus*. × ½.

much more slender than the preceding is of the same general type, may possibly be the humerus of *Archæolemur majori*, though no skull of the latter species occurs in the collection *.

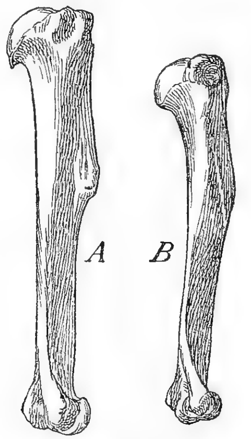
It will not be needful to describe in detail this series of bones. Their most interesting feature is the fact that they show many points of agreement with the humerus of the members of the genus *Lemur*. The proximal end of the humerus of

* None of the arm-bones of *Archæolemur* in our collection appears to equal in size those figured by Dr. Grandidier in his recent memoir as belonging to *Bradylemur robustus*, so that this form will stand as a fourth *species* of *Archæolemur*.

Archæolemur may be said to possess features intermediate between *Lemur* and *Propithecus*. If, indeed, a robust specimen of the humerus of *L. jullyi* or *L. majori* be compared with those of *Archæolemur*, the general agreement of the two bones is unmistakable (see text-fig. 32); there are at the same time certain features which show a distinct affinity with the Indrisine type of humerus. These become more apparent if the more slender bone which we have provisionally referred above to *Archæolemur majori* be compared with that marked **15** in the table. This latter is apparently the humerus of *Mesopropithecus*, and a brief description of it will now be given (text-fig. 33).

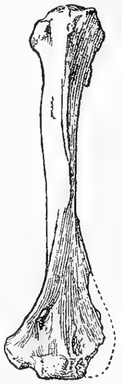
Mesopropithecus.—This bone is somewhat longer and considerably more robust than the humerus of *Propithecus*. Its upper portion is more flexed than the latter bone,

Text-fig. 32.



Humeri of (A) *Archæolemur edwardsi* and (B) *Lemur jullyi*, compared.

Text-fig. 33.



Humerus of *Mesopropithecus pithecoides*.

being intermediate in this respect between the modern *Lemur* and *Propithecus*. The head is more spherical (*i. e.*, less ovoid in form) than is the case with either of the extant subfamilies. The shape and position of the greater tuberosity more nearly resembles that of *Archæolemur* and *Propithecus* than that of *Lemur*, while the lesser tuberosity is intermediate between *Archæolemur* and *Propithecus*, the groove which separates this tuberosity from the head of the humerus being less marked than in the extant genus, though more prominent than in either *Archæolemur* or the Lemurs, whether recent or subfossil.

The "deltoid" crest bears much resemblance to that of the slender humerus of *Archæolemur* referred to above, the roughened surface for muscular attachment on the outer side of the bicipital " lip " being closely similar in the two bones, though there is in *Mesopropithecus* a short prominent ridge about 1 cm. in length running down from the lower angle of the greater tuberosity, which evidently has its homologue in the well-marked crest which in the fossil " Lemurs " is continued downwards in a spiral course to join the lower end of the deltoid ridge. The distal end of the bone is imperfect, but its trochlear surface apparently bears more resemblance to that of *Propithecus* than to that of *Archæolemur*. The long, projecting, backwardly-curved outer epicondyle is, on the other hand, strongly suggestive of the corresponding part of the humerus of *Archæolemur*.

Lemur.—The humeri, the dimensions of which are given in Table 19, Nos. 16–26, are all referable to the genus *Lemur*. They are all very similar in size and type, as might be expected from the similarity which we have noticed in the series of skulls of this genus. A detailed description of this bone will not be necessary for my present purpose. It is interesting to note in passing, however, that its straighter shaft tends (text-fig. 32, B) to approximate it to the humerus of *Archæolemur*.

The Radius.

Appended is a table (No. 20) giving dimensions of several types of radius occurring in the collection from Ampasambazimba. Only two of these will be referred to in the present section—those of *Megaladapis* and *Palæopropithecus*.

Megaladapis.—The radius of *Megaladapis* (Nos. 1–6 in Table 20) is a long, somewhat slender, curved bone (text-fig. 34). The curves of its *head* correspond exactly with the capitular surfaces of the humeri already described, and with the lesser sigmoid cavity of an ulna to be presently referred to. Its *neck* is somewhat slender, its *tubercle* long and much roughened, showing the possession of a powerful biceps muscle. The shaft is widely curved, its centre being some 2 centimetres distant from a chord joining its two extremities. With the exception of this greater curvature and its mere slender proportions, the radius of *Megaladapis* bears a considerable resemblance to that of Man. The interosseous edge has a regular curvature which hardly deviates from a plane bisecting the radial head and passing through the styloid process. The three articular facets for the ulna, scaphoid, and semilunar bones are very similar in shape and disposition to the condition seen in Man. The styloid process is less prominent, and the diverging lines of the inner and outer edges of the distal end of the bones are less abruptly curved than in the human radius.

It is not, of course, intended to imply by such a comparison that there is any close connection between such an animal as *Megaladapis* and Man, but merely to point out that types which by their brain-development are removed as far as possible from each other in the Primate series have both retained similar features in their limb-structure. At the end of his text-book on 'Morphology and Anthropology,' Professor Duckworth concludes that the balance of evidence indicates that, were the material still available,

TABLE 19.—Giving dimensions

8 humeri of *Megaladapis* [**1–8**].
1 humerus of *Palæopropithecus* [**9**].
4 humeri of *Archæolemur edwardsi* [**10–13**].

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	From the summit of head to capitulum..	321	319	295	280	274	294	294·5	..	210·5	152
2.	From the summit of head to trochlear surface	321	317·5	297·5	277·5	274	293·5	293	..	208	152
3.	Maximum breadth of distal end [between epicondyles]................	61·5	60·5	59	62·2	59·5	60·5	60	60	45	41·2
4.	Maximum distance between greater and lesser tuberosities	42	40·5	41·5	46·5	42	40·5	41·5	..	50	32·2
5.	Vertical diameter of head	36·5	37	40	39	39·5	38	38·5	..	37	26
6.	Transverse diameter of head	36·5	36·5	38·5	35·5	37	36	38·5	..	37·5	25
7.	Minimum antero-posterior breadth of the diaphysis	18	18·5	19·5	21	18·5	21	18	19	19·5	15
8.	Maximum thickness of external condyle.	21	22·2	21·5	24	22	22·5	22	23	19	14·5
9.	Maximum thickness of trochlea	18·5	19·5	21	20·5	21	21	21	20·2	19·2	15·5
10.	Width of inferior surface of capitulum..	14	14·5	15·2	15	15·5	14·5	13·5	16	10·2	9
11.	Minimum transverse breadth of diaphysis.	12·5	12·5	15	16	15·5	17·5	15·5	15·5	10·5	11
12.	Width of inferior surface of trochlea....	21	22·5	21·8	21	19	18	21	18·5	[16·8]	14·5
13.	Minimum thickness of trochlea........	13·5	13·2	15	16	16	14	14	15	19	22·5

the descent of Man would be traceable by a line collateral to that of the Simiidæ from a Tertiary "Lemuroid" ancestor. To connect such ancestor with progenitors of a degraded form like *Megaladapis* may at first sight seem unreasonable, but we have evidence which apparently warrants our connecting the Lemurinæ with such ape-like forms as *Archæolemur*. If, then, we are correct in classing *Megaladapis* among the Malagasy Lemurinæ, there is a strong probability that its ancestors were once as far advanced as *Archæolemur* in brain-development. The occurrence in the ancestry of the Hominidæ and Simiidæ of forms as low in the scale as the ape-like progenitors of *Archæolemur* and *Hadropithecus* is at all events only a question of greater or less remoteness in geological time; and if it is necessary to trace back the lines of descent of such nearly related forms as the Hominidæ and Simiidæ to middle or early Tertiary times to arrive at their common ancestry, we see at any rate how in (in millimetres) of

1 humerus of *Archæolemur majori* (?) [14].

1 humerus of *Mesopropithecus pithecoides* [15].

11 humeri of *Lemur* [16–26].

11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.
155	164·5	147	148	[132]	123·5	120	123·5	125	120	122	120·2	119·5	124	122	126
153·5	164	147·5	147·2	[132]	123·2	121	122·5	124	120·5	121·7	120·2	119·5	124	122·5	126
49·5	41·5	40·5	34	39	[34·5]	33·5	34·5	32·5	34·8	[34]	30	30·5	30·2	[29·5]	29·8
31·5	34	33·5	26	25·5	24·2	24	26	21·5	23	23	21	21	22	24·8	22·5
22·5	23	23·5	18	18·8	17·5	19	18·5	17·5	17·2	17·5	17·5	16	17·5	16·5	17
24	24·5	22·5	21·5	17	18·5	17·5	17	16·5	16·5	17·5	16	15	16·5	16·8	17
14·5	14·5	13·5	11·5	10	12	11·5	11·5	10·5	11·5	11	11·2	10·5	11	10·7	10
14·5	14·5	12·5	12	10	11	[9·5]	10·2	10	10	10	10·5	8·8	10	[10]	10·2
14·5	14·7	13	12	10	12·5	12·2	12	11	11·5	11·5	11	10	10·5	10·5	10·5
9·5	10·5	10·5	9·5	[9·5]	9·5	9·5	9	8	9·5	8	8·5	7·5	7·8	8·5	[8]
12	10	19	8	6	10·5	9	9	8	6·5	8	9·5	7	7	9	8
[19]	[20·5]	[17·5]	15·7	[11·5]	14·5	14	14·5	13·5	13	13·5	11·5	13·5	13·7	13	12·8
22·8	26	22	7·5	8·8	8·8	10	8·8	9	9	9	9·2	8	9·2	8·8	8

their case similarity of conditions and mode of life *has retained with but little alteration* characters derived from such common ancestry. That *Megaladapis*, whose size has corresponded with that of Man and the Anthropoid Apes, should have retained with little alteration certain features of its limb-bones which connected it with these highest representatives of the order, seems to me a more probable explanation than to maintain that such features have been secondarily acquired.

Palæopropithecus.—This radius is numbered 7 in Table 20. It is from the right side. A reference to text-fig. 35 shows it to be a very stout, much curved bone. The concavity of the head corresponds with the curvature of the *capitulum* of the humerus of *Palæopropithecus* described above, though the latter bone is from the left arm. The circumference of the head also fits the lesser sigmoid cavity of an ulna which will be referred to under the next heading. The posterior edge of the circumference of

TABLE 20.—Giving dimensions (in millimetres) of six radii of *Megaladapis* [1–6]; one radius of *Palæopropithecus* [7]; eleven miscellaneous radii [8–18].

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
1.	Length from head to styloid process	286·8	..	..	..	293	295·5	133·2	158	151·5	143	136	139	138	144·2	..	143·2	..	132
2.	From head to bicipital tuberosity	45·8	49·8	46·5	45	47	54·2	54	27	24	25	25	26·5	27·8	26·2	21·5	23·8	27·5	26·5
3.	Maximum breadth of distal articular surface	33·2	..	..	..	31	29·5	31·5	22·2	23·8	19	16·5	15·5	14	16·5	..	14·5	..	15·2
4.	Maximum diameter of head	23	22	21	22	22·5	23	26·5	14	13	13·8	11·2	11	10·8	13·8	8·5	8·8	10·5	10
5.	Maximum thickness of distal articular surface	[11]	..	..	..	15·5	15	[16]	14·5	11·8	[11·2]	9·5	9	7·3	10·5	..	7·5	..	8·8

TABLE 21.—Giving dimensions (in millimetres) of eighteen ulnæ.

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
1.	Maximum length from olecranon to styloid process	[290]	..	..	..	159·5	159·5	151·2	..	148	..	..	153	..	163	..	153	..	163
2.	Width from styloid process to the inferior radial articular surface	..	..	..	..	4·1	5	5	..	5·5	..	..	5	..	5·2	..	5·8	..	6
3.	Maximum length of greater sigmoid fossa	23·8	19·2	14	14	11·2	13·5	14·5	10	12·5	13·2	14·5	12	14	15	13	13	11	12·2
4.	Length from summit of olecranon to its tip	10	9·2	8·2	12·5	14·2	12	12·8	12·5	11·5	12·5	11	13	[8]	12·5	12·8	13·8	13·5	12
5.	Length of lesser sigmoid fossa	15·5	17	10	10	8·8	6·5	8·5	6	7·8	6·5	7·5	7·5	[6]	7·5	5·5	5·8	6·7	6·4
6.	Minimum transverse width of diaphysis.	12	14	5	8	6·1	4·1	6	7·5	6	5·5	7·5	7	5	7	5·2	4·2	7·8	6·5

the head is considerably raised, while the small articular facet on the anterior border is depressed, thus causing the plane of the proximal end of the bone to lie somewhat obliquely with reference to the long axis. The tubercle is wide and has a deep oblique depression. The interosseous edge is less sharp than in *Megaladapis* and its lower

Text-fig. 34.

Radius of
Megaladapis grandidieri. × ½.

Text-fig. 35.

Radius of
Palæopropithecus maximus. × ½.

fourth is much roughened. The anterior surface is deeply concave. The outer edge of this concave surface is clearly defined by a ridge of regular curvature running from the lower end of the *tubercle* nearly to the carpal end of the bone. The central part of the posterior surface is broad and flat, but its outer edge does not present the sharp angular ridge seen in *Megaladapis* owing to the very convex transverse curvature of the outer surface of the bone. The outer edge is continued down to a prominent tubercle (the "middle thecal tubercle" of human anatomy), but in the bone under consideration it is a broad prominent ridge of about 1 inch in length. The two facets seen on the inferior surface of the radius of *Megaladapis* are here represented by a single concavity of roughly semicircular outline which extends across the end of the bone from the styloid process to the lower edge of the *sinus lunatus*.

The Ulna.

The two ulnæ referred to in the previous section will alone be here described. That figured (No. 1 in Table 21) is the ulna of *Megaladapis* (text-fig. 36). Its carpal end is imperfect, but its length estimated from its corresponding radius is approximately 290 mm. This bone is slender and much curved, its curvature being slightly less than that of the radius. The proximal end is remarkable for its curious general resemblance to that of the Hominidæ. The greater sigmoid cavity is broad and deep. It is less distinctly divided into two lateral halves than in the human ulna. The coronoid process is high and somewhat oblique in direction and internal in position. The olecranon does not extend backwards beyond the sigmoid cavity in a long process as in the majority of the Lemuroids and Monkeys, but its condition closely resembles that of Man. Its lower surface is rounded off, being convex both transversely and longitudinally. The shaft of the bone has a somewhat rounded anterior ridge, the surface external to this ridge being concave, while the internal one is convex. The posterior surface is broad and flat. The external boundary of this under surface is a long sweeping curve which can be traced from the lesser sigmoid cavity to the broken distal end of the bone. Between this curve and the outer edge of the anterior surface is a narrow external surface whose sides run nearly parallel at a distance of 3 or 4 mm. apart along the lower three-quarters of the bone.

The ulna of *Palæopropithecus* is a short stout bone, broken and apparently abnormally enlarged at its distal end (text-fig. 37). Its proximal end bears a curious resemblance to that of the ulna of *Megaladapis* just described. The greater sigmoid cavity is more distinctly divided into two trochlear surfaces of articulation, and the coronoid process is somewhat broader in the transverse direction. The shaft of the bone is rather stouter in actual dimensions than that of *Megaladapis*, the under surface being much more rounded in section. The angles limiting the various surfaces are less clearly defined, and some of the areas for muscular attachment are rougher in the shorter bone.

It may be of interest to compare the radio-humeral index of *Megaladapis* and *Palæopropithecus* with that of the Simiidæ and Hominidæ. This index is derived from the formula

$$\text{Index} = \frac{R \times 100}{H}.$$

In the case of *Megaladapis* the average lengths of three humeri and three radii are taken. The figures for Man and the Anthropoid Apes are quoted from Duckworth's 'Morphology and Anthropology':—

Palæopropithecus	63·2
Megaladapis	93·8
Gorilla	80·1
Chimpanzee	94·5
Simia	102·7
Hylobates	115·5
Hominidæ	81

Text-fig. 36.

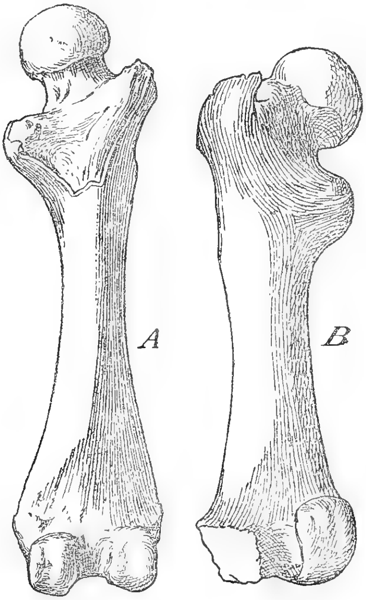
Ulna of *Megaladapis grandidieri.* × ½.

Text-fig. 37.

Ulna of *Palæopropithecus maximus.* × ½.

It is thus possible with the material above described to construct the arm of both of these giant Lemuroids. Unfortunately the same cannot be said of the lower limb. In view of the large number of individuals both of *Megaladapis* and *Palæopropithecus* represented by the remains exhumed at Ampasambazimba, the almost total absence of the large bones of the lower limb of these animals is very remarkable. One perfect and one incomplete femur have been found resembling in their general appearance the femur of *Megaladapis edwardsi* figured by Dr. Lorenz in his recent memoir on this fossil; but these bones are much too small to belong to the gigantic *Megaladapis* described in this memoir. In text-fig. 38 are figured two femurs which I am not able satisfactorily to refer to any of the crania described in this memoir.

Text-fig. 38.



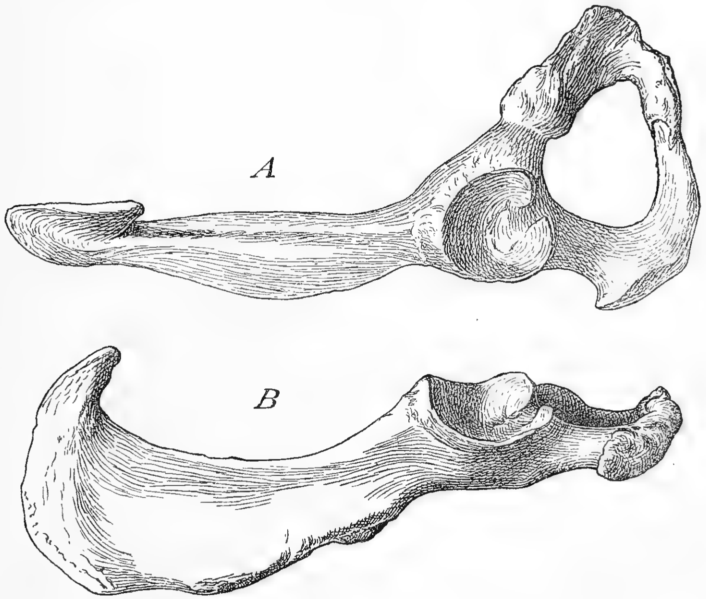
A. Femur of type referred to by Grandidier and Ameghino: still undetermined.
B. Femur of *Megalindris gallienii*. $\times \frac{1}{2}$.

The femur marked A closely resembles one figured by Grandidier and referred by him to an extinct Edentate which he named *Bradytherium madagascariense*. Ameghino, however, in speaking of this femur, thinks it hardly possible to attribute it to a Sloth. He says "Ce groupe [the Sloths] s'est constitué à une époque très récente, quand la communication entre l'Afrique et l'Amérique du Sud n'existait plus, ou était incomplète, représentée par une chaîne d'îles. Des animaux arboricoles, les plus lents que l'on connaît, et qui ne s'éloignent jamais de la localité qui les a vu naître comment auraient-ils pu passer au continent Africain et arriver jusqu'à Madagascar? Le fait est tellement improbable qu'il paraît presque impossible."

His conclusion as to the character of the bone itself is that while it bears a distant resemblance to the femur of *Bradypus* it more closely resembles that of the Lemurs. He says: "The heavier and more massive appearance of this bone compared with that of extant Lemuroids is easily explained by the very large size the fossil species must have attained to; it is also to this same cause that the small height of the great trochanter must be attributed. I think, then, that the femur described as belonging to a Sloth of the family of the Bradypodidæ belongs to an extinct Lemur of great size, probably to *Megaladapis madagascariensis* or to a related species."

The very curiously flattened shaft of both these femurs seems to me of interest in connexion with the supposed aquatic mode of life of some of the extinct Lemuroids before described, as this flattening of the femoral shaft is a feature which may be observed in aquatic mammals belonging to various orders. The femur of *Palæopropithecus ingens* figured by Dr. Grandidier in his memoir on 'Extinct Lemuroids' presents the same peculiarity.

Text-fig. 39.



Os innominatum of *Palæopropithecus maximus* (?).
The ischiac portion has been broken and re-set during life.

I propose provisionally to denote the second of these femurs (text-fig. 38, B) by the name of *Megalindris gallienii* after the distinguished founder of the Académie Malgache. The dimensions of this femur are given in Table 22, No. 28.

The subjoined tables include series of tibiæ and scapulæ and pelves, but the only bone to which any reference is here necessary is the *os innominatum* shown in text-fig. 39

TABLE 22.—Giving dimensions (in millimetres)

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	Length between summit of head and lower surface of internal condyle ..	146	150	150	145	158·5	148·2	153	189·8	151	149	144
2.	Width of bone above third and lesser trochanters	27	29	30	29	29·5	32·8	32·5	31	30·5	29·8	33·5
3.	Minimum width	12	13·2	15	13·5	13	13·2	16·5	13·2	13·7	12·8	12·8
4.	Height of neck	14	14·8	14	15·8	14·2	14·9	17·5	13·8	14	15	13·2
5.	Width of neck	10·8	13·5	13	13	13·5	13	14·5	12·8	11·8	13·8	12·2
6.	Antero-posterior diameter of head....	16·8	18·2	19	18·5	19	18	20·5	18	18·7	18	17
7.	Transverse diameter of head	16·5	18·5	18·8	18·2	18·8	18	19·8	[18]	17·7	18	17
8.	Angle made by axis of head with axis of shaft	36°·8	41°	40°·5	40°·7	41°·8	42°	42°	[42°]	40°·5	41°·5	33°·5
9.	From summit of head and upper surface of third trochanter........	47	47	49·2	47	45·5	48·2	54·9	45·2	48	48·9	43·5
10.	Length of digital cavity............	20	18·8	22	21	19	21	21·8	22	20	20	17
11.	Maximum width of digital cavity....	10·5	7	7·5	7	6·8	7·2	9·5	8·8	7·5	9·5	7
12.	Thickness of femur between the condyles	13·5	14·8	18	16	14·2	15·8	16·2	16	15	15	14·8
13.	Thickness of femur at narrowest part of shaft	10	11·8	13·2	12·8	12	12	12·8	12	11·5	11·8	11·8
14.	Antero-posterior width of external face of external condyle..........	20·8	23·5	25·8	25·2	24·8	25·8	26	[22·4]	22·8	24	23
15.	To maximum width between outer edges of posterior surfaces of condyles.	24·8	27·8	29·8	[27]	29·5	29·2	30	[32]	27·2	27	25·2
16.	Length from great trochanter to internal condyle	149·8	154	154·2	147·5	153	154·8	157·2	154	155·8	152·5	148
17.	Maximum width of great trochanter..	33·9	34·9	36·8	36·2	35·2	36·2	41·8	38·5	35·1	35·5	[32·5]

TABLE 23.—Giving dimensions (in millimetres)

		1.	2.	3.	4.	5.	6.
1.	Maximum length	166	159·5	[142·5]	137·8	128	125·2
2.	Maximum diameter of proximal end	35·5	36·8	18·2	[17·8]	27·8	27
3.	Antero-posterior diameter at level of anterior tuberosity ..	28	25·8	15	13·8	21·8	23·8
4.	Minimum antero-posterior diameter of head	[24]	24·5	13·8	14	16·8	19
5.	Maximum transverse breadth of distal end	22	23·2	[13·2]	13	18	16·8
6.	Antero-posterior diameter of middle of shaft	12·2	10·8	5·8	5·8	9	8·8
7.	Height of malleolus (perpendicular)....................	8·5	10	..	5·5	7	6·8

of twenty-eight femora.

12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.
137	138	135·2	142	144·2	151	[210]	150·8	..	[129·9]	102	183	190·5	176·8	190	..	185·2
29·8	26·8	27·5	21·2	26	30	23·9	19·5	[22]	17	10	29	33·8	[26]	35	[28·8]	49
14·2	13·9	12·5	11	13·1	13·9	10·8	9·9	11·5	8	6·5	17	18	17	17·8	18	26
15·2	15·8	13	14·2	16	15·2	..	10	12·8	8	7	17	17·5	18	17	17·8	29·5
12·2	9·8	10	10·2	13·5	12	..	7·5	11	5·8	4·8	12	15	16·8	13·8	13·5	20·8
19·8	17·1	16·5	17	17	19	..	10·8	15	10·5	7·8	21·5	23·5	[19·2]	23·5	22·2	34
19·8	17·8	16·8	17	17·2	18	..	11·8	15·2	10·2	8	21·5	23·5	23·5	23	23	34·8
45°	41°	41°·5	40°	42°	40°	[52°]	44°·5	41°	38°·5	38°	35°·3	39°	37°·2	38°·5	..	31°·8
44	42·8	41·8	40	46·8	49·2	..	32·2	[42·5]	27·8	17·2	66	68	64	65·2	64·5	81·5
[18]	17	16·8	17	[18]	19·5	[25·5]	23·5	23	12·8	9	29	[31]	27·5	31	29	[25]
8·5	7·5	7	11·5	[8·5]	9	[7]	6·5	5·5	4·8	3·5	14·5	11·5	10·5	14	13	[7]
14·8	14·2	13·8	13	13·2	14·8	15·8	12	..	..	9·8	17·5	19	18·5	19	..	21
11·8	11	11·5	10·5	11·2	11·5	9·8	7·8	[12·5]	8	6	16·5	17·8	13·8	15·5	16	18
22·2	22·5	20·9	21·8	[22]	22·9	28·2	19	..	..	15·8	28·8	[30·5]	[27]	31·8	..	[44]
27·1	[27·5]	16	24	[29]	27	24·2	17·5	..	[14]	14	37·5	[40·8]	[37]	43·5	..	52
[139·8]	140	139·5	144·8	[147]	156	204	154·8	..	[134]	104	187·5	195·2	180·5	196	..	[182]
[36·8]	31	32	33	[34]	34·5	..	27	34·5	[23·5]	16·8	52·5	52	50·5	52·8	[46·3]	58·5

of twenty-one tibiæ.

7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.
127	130·5	119·3	121·5	128·2	128	119·7	122·8	128	118·8	132	151·5	92	185	164·8
[25]	28·7	[24]	27·5	26·5	26	26	25	23	24	29	33	[10]	24·5	23
[19]	21	[20·5]	20·2	20	[20·5]	21	[22]	22	20	24	21·5	5·1	8·8	8·2
[15]	16	..	17	16·5	16	17·2	21	19	16	19·2	19·5	8·5	11·8	
15·8	16	15·5	17·8	15·8	[17·5]	17	19	14·5	13	18·5	20·8	8·5	15·2	15
8	10	8·8	10	8·2	7·5	8·1	11·2	8·2	7·5	8·7	8·2	4·8	13	12·8
6·5	6	6	7	7·5	6·2	7·8	[7]	6	6	6	6·8	3·9	7·2	[5]

TABLE 24.—Giving dimensions (in millimetres) of scapulæ.

		1.	2.	3.	4.
1.	Length of axillary border	63·5	70·5	..	..
2.	Length from spine to summit of acromion	74·5	74·5	..	68·8
3.	Length of coracoid border to end of glenoid cavity	77·5	78·5	..	69
4.	Length of vertebral border	47·5	48·5	..	..
5.	Length of spine at its base	63·8	63·5	..	86
6.	Vertical diameter of glenoid cavity	19·2	19	27	24
7.	Length of coracoid process	17	..	24·8	22
8.	Maximum transverse diameter of glenoid cavity	11	11·2	15·5	15
9.	Breadth of coracoid process at its base	9·5	..	13	11

(Nos. **1** & **2** in Table 25, p. 144). This elegantly formed bone apparently does not belong to any of the animals described in this memoir. The acetabulum shows a large depression for the insertion of a *ligamentum teres*, but the only two femora the heads of which at all agree in size with this acetabulum (viz. those just referred to above) are apparently quite without any corresponding imprint for the round ligament. That this pelvis belongs to an animal of "Lemuroid" type there is no doubt from the elegant everted hook-like form of the upper part of the ilium. It is too large to correspond to the femora of *Archæolemur*, several of which occur in the Collection. It may possibly be the pelvis of *Palæopropithecus*, though it appears somewhat slender for so massive an animal.

COMPARATIVE SURVEY AND CONCLUSIONS.

It will be useful in conclusion to take a general comparative survey of the groups described in the preceding sections, with a view of ascertaining what conclusions may be legitimately drawn towards the solution of the problems proposed in the introduction of this memoir.

Briefly stated these problems are as follows:—

(1) What relationship do the recently-discovered subfossil Malagasy Lemuroids bear to each other and to the existing Lemuridæ and Indrisinæ?

(2) What conclusions may be drawn from a study of these subfossil forms as to the origin of the Lemuroid fauna of Madagascar?

(3) In particular, what light, if any, do these subfossil Lemuroids throw on the probable course of development of the Old and New World Monkeys?

In endeavouring to answer these questions there are certain considerations which might be expected *à priori* to offer some guidance as to the directions in which a solution of these problems might be looked for.

We might begin by asking the question: What would be the probable course of evolution of a group of Primates isolated since early or middle Tertiary times, confined to a limited area, and removed from competition with the dominant Mammalian groups which at a later date spread over the African Continent?

Various analogies suggest a probable answer to such a question. The Malagasy flora (in which, according to Baron, three-fourths of the species and one-sixth of the genera are peculiar to the island) would lead us to expect a considerable amount of specialisation and divergence from the most nearly allied continental forms. Again, even a cursory view of the Malagasy representatives of certain other Mammalian orders—*e. g.* the Insectivora and Rodentia—not to mention the non-Mammalian groups—would fully confirm this surmise.

Now it is evident that the course of evolution which has pre-eminently characterised the Primates on the great land-areas has been one of brain-development. We shall, indeed, probably be justified in maintaining that it has been by the acquisition of superior brain-power rather than by superior strength that the members of the order as a whole have been able to escape extinction.

The removal of a group of Primates from connexion with extensive continental areas, and their isolation in a large island, would probably in course of time so modify the conditions of existence as to eliminate much of the struggle which had hitherto been one of the main factors of the brain-development of the race. One might therefore expect an arrest of such development, and possibly even a "retrogressive evolution" leading to actual degeneracy and loss of brain-substance.

Now the evidence brought to light by recent discoveries does in fact substantiate these *à priori* surmises.

In the existing Lemurs of Madagascar we have a highly specialised group many of which have widely diverged from their nearest representatives in other parts of the world. *Chiromys* may be taken as an extreme instance of this specialisation.

In the case of the Indrisinæ we have been able definitely to connect the existing genera with various extinct subfossil forms which in many of their characters give striking evidence of descent from Ape-like ancestors.

These pithecoid subfossil Lemuroids themselves, however, show signs of specialisation and retrogressive changes, in some cases carried even further than in the extant genera.

Now in order to bring into clearest relief the fact that these Malagasy genera living and extinct of the Indrisine group do, considered as a whole, retain many characteristics which undoubtedly point to descent from Ape-like ancestors already possessing most of the features which we associate with the true Monkeys, I propose to discuss

TABLE 25.—Giving dimensions (in millimetres)

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	Maximum length of os innominatum	245·5	241	..	185	..	..	..	..	..	..
2.	From summit of ilium to superior edge of acetabulum	156·5	146	140	117	[95]	..	[86·5]	..	..	[87·5]
3.	Maximum diameter of acetabulum	48	47·5	36·5	25	24·5	25·5	22	19	21·5	23
4.	Minimum diameter of body of ilium (above acetabulum)	30	28	20	25	21·5	25·2	17	14	16	16
5.	Breadth of ilium at level of iliac spine......	87	83	..	82·8	..	..	..	..	..	..
6.	Width of sacral surface	32·5	30·5	25	26·5	18	25	16·2	14·5	[16]	[16·5]
7.	Distance from pubic suture to ischial tuberosity	109	..	..	..	..	..	..	..	..	..

briefly a considerable number of the characters enumerated by various writers as differentiating the "Lemuroidea" from the "Anthropoidea."

Several preliminary observations should, however, be made before entering on this comparative survey:—

(1) It should be clearly realised that all the subfossil Lemuroids hitherto described although *extinct* are of very *recent* date, and from the biological and geological points of view are the contemporaries of the existing genera.

(2) In considering the characters of a group of animals, especially where marked specialisation and retrogression have occurred, it will not always be possible to distinguish between *ancestral* and *acquired* characters.

(3) When any doubt exists we are on the whole more likely to be correct when we interpret as *vestigial* rather than as *recently acquired* any suggestions of Simian affinity *.

(4) It is in regard to brain-development and such structures as depend upon brain-development that we are likely to find the least satisfactory evidence as to close actual affinity with the higher Primates; but, on the other hand, it is here that we shall find the clearest evidence of *degeneration*.

(5) Where all the Malagasy genera agree in possessing in various degrees some character which would ordinarily be described as "Lemuroid," it may be often possible

* It should be noted that it is some of the *extinct* genera of Lemuroids which show the greatest number of "Anthropoid" characters; and it would seem more reasonable to regard these features as *ancestral* than to consider them as adaptive modifications which have arisen by convergence *in Madagascar*. We have seen, on the other hand, that the specialisation in certain directions to which apparently the recent Lemurs owe their survival (*e. g.* the procumbent pectinate disposition of the lower incisors) is just such as has tended to disguise their close relationship to the Simian type.

of twenty-seven pelves.

11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.
..	..	..	..	..	..	..	..	..	[91]	80·5	..	..	..	..	[66·5]	
..	[72]	[87]	[88]	[70]	..	[84]	[74·5]	..	[55]	52·5	[52·5]	..	[53]	..	45·2	
20·2	24	23	20	22·8	22	23	29·5	14	14·5	13·5	14	13·8	14	13	11	9·5
15	16	16·8	14	17·5	18	17	13	10	12·5	11	8·5	10	11	10	6	5·5
..	..	..	..	..	..	..	..	..	[26]	[22·5]	[17·5]	..	[23·5]	..	[15]	
[16]	[14·5]	[16]	[15]	[15]	18	15·2	[17·5]	..	8	[10]	[12·5]	[8]	8·5	[10]	4·5	[5·8]
..	..	..	..	..	..	..	..	..	32	31	..	..	..	..	24	

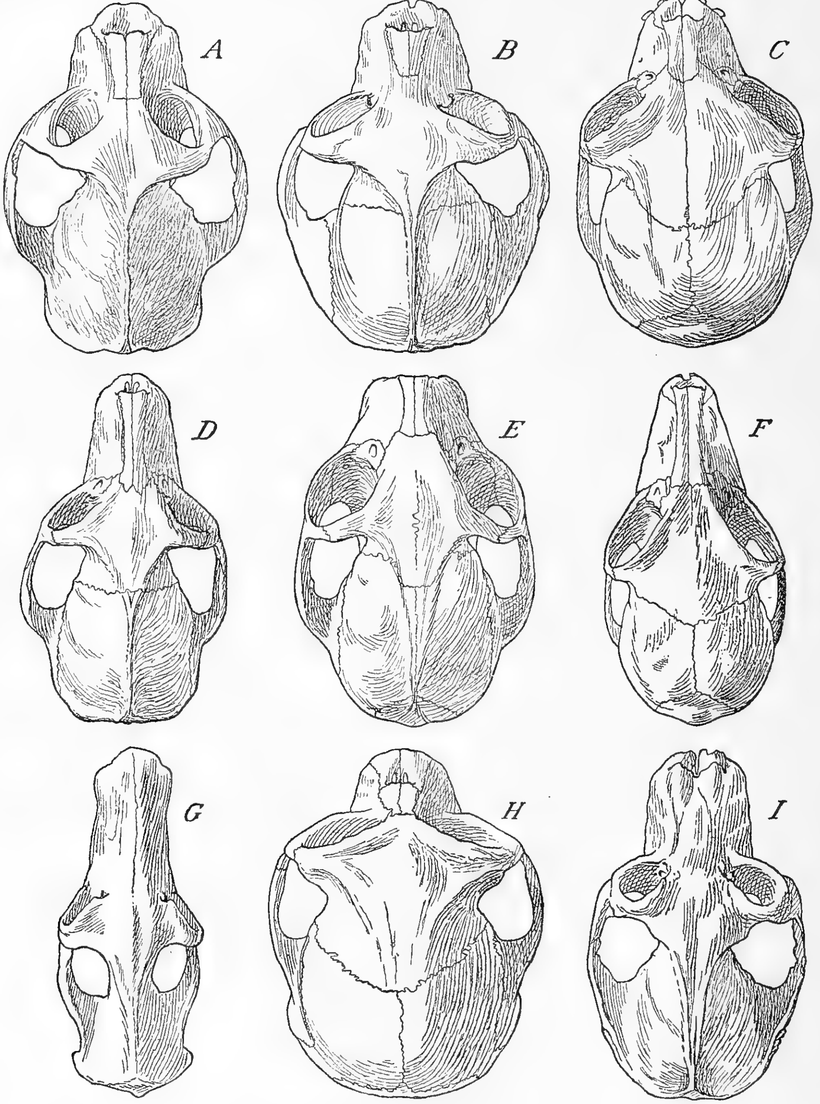
to name some genus or species of Monkey where a similar character occurs. Should such examples prove to be chiefly drawn from one or two families, the presumption will be strong that they are not mere examples of convergence, but point to community of origin (see text-fig. 48, p. 152).

To begin, then, our comparative survey :—

The Brain.—A comparison of the various subfossil Malagasy Lemurs reveals one feature which is common to all of them without exception, and which has therefore been repeatedly referred to in the previous descriptive sections, namely, the curious narrowing of the frontal region of the skull immediately behind the orbits. The annexed figure (text-fig. 40) shows the outlines of these various skulls all reduced to a common unit length for convenience of comparison. Examples of the nearest extant genera and the skull of a New World Monkey are also appended.

If it is asked what has caused this curious narrowing of this region of the skull, it is only possible to offer one or two suggestions. It is noteworthy that it is in all the *extinct* forms that this peculiarity is most marked. Dr. Elliot Smith points out in his report on the brain-casts of *Mesopropithecus*, *Palæopropithecus*, and *Lemur majori*, which is published simultaneously with this memoir, that it is the frontal lobes of the brain which are the latest to be evolved, and it is this region which is the first to go when retrogressive evolution occurs. May not the loss of intelligence which this degeneracy connotes be among the causes of the disappearance of these forms? It is also perhaps not a mere coincidence that these forms all have relatively more massive mandibles than the extant genera. The presence in nearly every case of a sagittal crest and widely curved zygomata implies the possession of powerful temporal muscles. Is it not possible that the mechanical pressure of these muscles

Text-fig. 40.



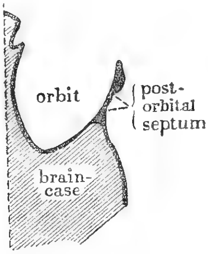
Showing vertex views of five genera of subfossil Malagasy Lemuroids compared with recent Lemurs and a New World Monkey:—A. *Archæolemur edwardsi*; B. *Mesopropithecus pithecoides*; C. *Propithecus diadema*; D. *Lemur jullyi*; E. *Hapalemur griseus*; F. *Lemur varius*; G. *Megaladapis grandidieri*; H. *Colobus*; I. *Palæopropithecus maximus*. These drawings are all reduced to unit length for convenience of comparison. Note the constricted postorbital region in all the extinct forms.

may have had its share in accelerating the process of brain-degeneration which had already set in? *

Postorbital Wall.—With the narrowing of the postorbital frontal region has probably come the almost complete disappearance of the postorbital septum. In the various families of Monkeys the frontal postorbital region is generally so broad and the orbits so comparatively small that the space to be filled in by the septum between the brain-case and the orbital bar is only a small fraction of the circumference of the eyeball—that is to say, a quite short outgrowth of the malar and frontal bones is sufficient to bridge across the vacant space between the orbital bar and the brain-case. The accompanying text-figure (41), which represents a transverse (nearly horizontal) section through the orbit of *Chiropotes*, will show how small the actual septum may be.

In the case of the Malagasy Lemuroids which we are considering the narrowing of the skull has carried the frontal, orbito-sphenoid, and alisphenoid far away from the

Text-fig. 41.



Transverse (nearly horizontal) section through the orbit of *Chiropotes*.

postorbital bar, so that supposing a septum did exist in a position analogous to that which it occupies in the Apes, it would have to wall in a space which may be expressed as equivalent to from 70 to 90 per cent. of the transverse diameter of the orbit. That a more or less completely ossified septum did exist, however, in the ancestors of the Indrisidæ seems probable, for there appear to be distinct traces of it both on the outer, upper, and occasionally inner edges of the posterior orbital contour †. Attention has been called, in the case of *Archæolemur*, *Mesopropithecus*, and *Palæopropithecus*, to

* I am aware that this theory would imply the transmission to offspring of a character acquired during the life of the individual; but it has yet to be satisfactorily shown that a cause acting during long geological ages may not be efficient where experiments extending over a comparatively few generations give purely negative results.

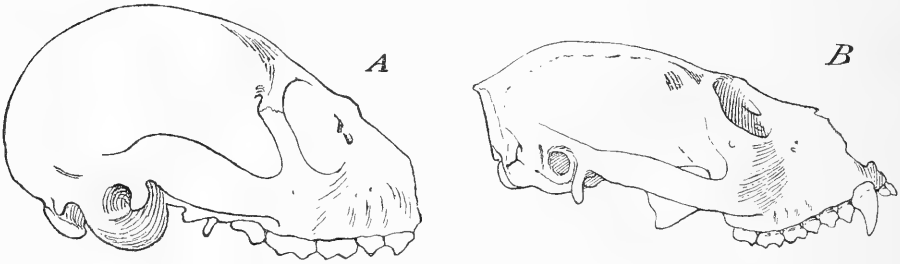
† In certain skulls of *Archæolemur edwardsi* there is a raised line on the *inner* wall of the orbit in exactly the position where the septum would abut on the skull-wall were it continuous behind the eyeball.

the broadening of the internal posterior edge of the orbital bar in both a vertical and horizontal direction. This inner edge is often so thin as to be quite translucent.

The extent of this apparently vestigial septum is disguised by the fact that the postorbital bar is triangular in section. If the actual internal measurement from the orbital rim to this sharp edge be expressed as a fraction of the transverse diameter of the orbit, in the case of *Archæolemur platyrrhinus* it is 47·8 per cent., in *Mesopropithecus* 36·8 per cent. Similar measurements taken in a horizontal direction from the inner anterior margin of the orbit to the posterior edge of the postorbital septum, and expressed as a fraction of the transverse diameter of the orbit, give in the case of *Chiropotes* 25 per cent., and in the case of *Nyctipithecus* 47 per cent.

The Occipital Region.—That the arrest of brain-evolution and actual loss of cerebral substance in the Malagasy Lemurs should have entailed other retrogressive

Text-fig. 42.



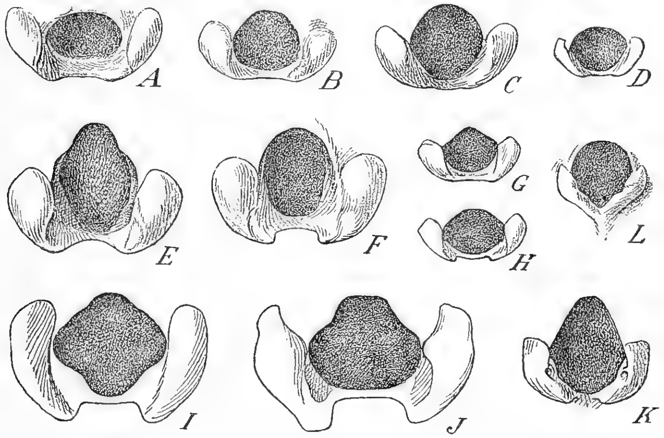
Inclination of the occipital plane of young *Mesopropithecus* (A) compared with that of *Alouatta belzebul* (B).

changes is not to be wondered at. The vertical occiput which is seen in the adult *Megaladapis* and *Palæopropithecus* is probably an instance in point. It is noteworthy in this connexion that the young of all the Lemurs appear to have the occipital plane much more inclined than the adult. That a vertical occiput may, however, be a secondarily acquired character depending on a massive mandible or on some peculiarity of the vocal organs is seen in the case of *Alouatta* (see text-fig. 42).

Long narrow occipital *condyles* have been mentioned by certain writers as a Lemuroid feature. We have seen in the case of several of the subfossil forms described in this memoir that the condyles are broad and rounded in shape, conforming rather to the "Anthropoid" than to the "Lemuroid" type (see text-fig. 43). A conspicuous convexity for the lodgement of the vermis of the cerebellum is found in the extant Lemurs, and has been mentioned as a characteristic feature. This is absent, at any rate in the adult, in *Archæolemur edwardsi*, *Palæopropithecus*, and *Mesopropithecus*.

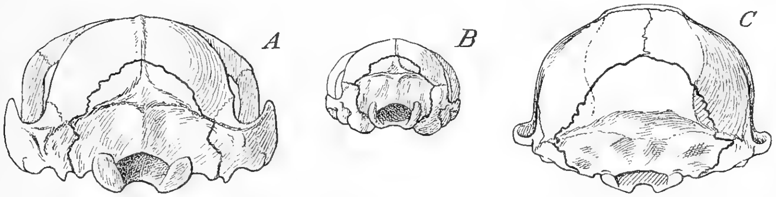
The great extent to which the supraoccipital enters into the skull-roof has been urged against the association of the Lemurs with the higher Primates; but, as we have seen in both *Palæopropithecus* and *Mesopropithecus,* the lambdoidal suture is but very little removed from the occipital crest, and examples may be found among the

Text-fig. 43.



Showing form of *foramen magnum* and comparative size and shape of occipital condyles in Lemurs and Monkeys:—A & B. *Archæolemur edwardsi*; C. *Archæolemur platyrrhinus*; D. *Propithecus*; E & F. *Palæopropithecus*; G. *Mesopropithecus*; H. *Lemur jullyi*; I & J. *Megaladapis*; K. *Papio*; L. *Colobus*.

Text-fig. 44.



Showing extent to which occipital bone enters into cranial roof in:—A. *Mesopropithecus pithecoides*; B. *Lepidolemur*; C. An Old World Monkey (*Cercopithecus denti*).

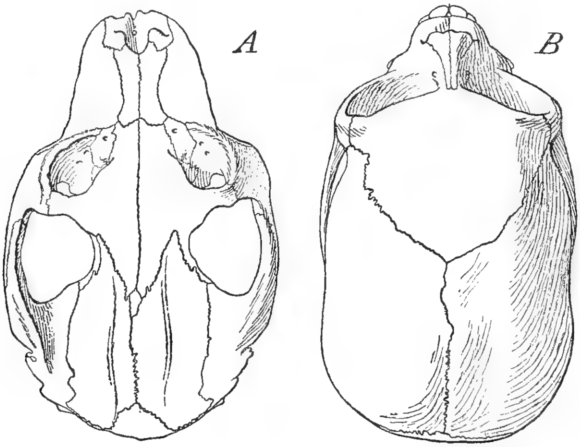
Monkeys in which the extension of this bone along the median line of the skull-roof is quite as great (text-fig. 44).

Frontal Region.—The small backward extension of the frontal bone along the skull-wall is another character said to differentiate the Lemurs from the Apes; but in this case, again, our fossils furnish instances in which this feature will compare with certain of the South-American forms, as the accompanying figure shows (text-fig. 45).

It should, moreover, be noted that the obliquity of the orbits is apt to disguise the extent to which the frontal in reality enters into the formation of the brain-case.

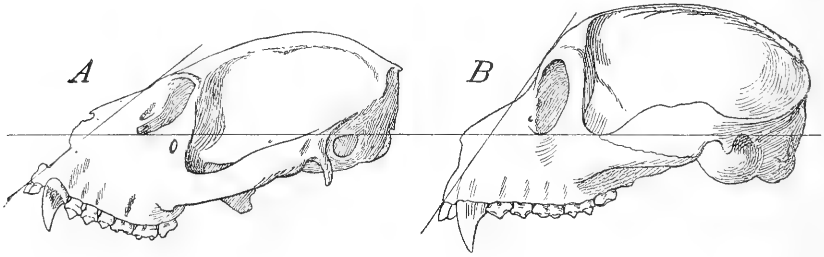
Again, it has been urged that the horizontal direction of the facial extension of the

Text-fig. 45.



Showing backward extension of frontal of *Palæopropithecus* compared with that of *Chiropotes*.

Text-fig. 46.



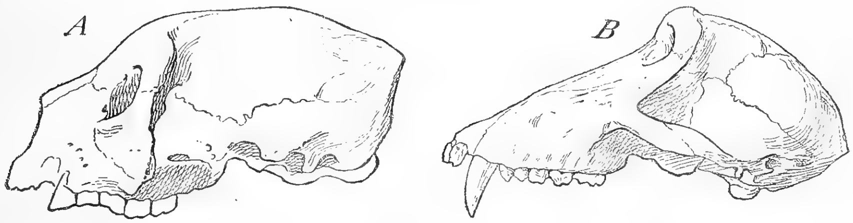
Facial angle of (A) *Alouatta belzebul* compared with that of (B) *Mesopropithecus pithecoides*.

frontal offers no analogy to the condition seen in the Monkeys. We have found, however, in the case of *Archæolemur*, and especially of *Mesopropithecus*, that this region of the frontal is by no means horizontal, but forms a true "forehead." In text-fig. 46 the profile of *Mesopropithecus* is compared with that of *Alouatta*, the facial angle being indicated in each case by lines tangential to the forehead and median incisors.

Nasal Region.—The length of the nasals is another supposed distinguishing feature of the true Lemurs. There can be no question that the lengthening of the muzzle and the concomitant development of the nasal fossa mark one of the directions in which specialisation has taken place among the Malagasy Lemurs. An extreme instance is offered by the newly-discovered species of *Megaladapis*. The most Ape-like of our fossils however, especially *Archæolemur platyrrhinus*, have comparatively short and broad nasals, somewhat larger it is true than those of the Cebidæ, but not greatly differing from these latter either in shape or size (see text-figs. 17 & 20). That the mere lengthening-out of the muzzle can in no sense be regarded as differentiating the Lemurs from the Apes is at once apparent on comparing such Malagasy forms as *Archæolemur platyrrhinus* with some of the Cercopithecidæ (see text-fig. 47).

Orbital Region.—We have already noticed one feature of the orbital region, but may briefly allude to two or three others in this place. The size and obliquity of the

Text-fig. 47.



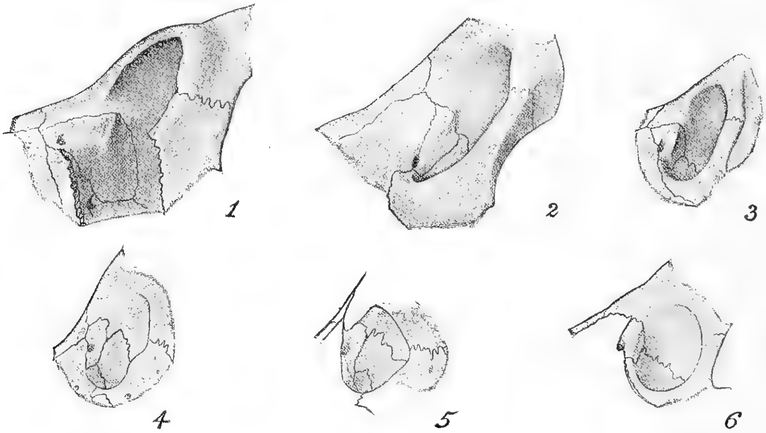
Truncated muzzle of *Archæolemur platyrrhinus* compared with the elongated facial portion of skull of *Papio*.

orbits of the Lemurs have been referred to as Lemuroid features. In both these respects some of our fossils range themselves rather with the Monkeys than with the recent Lemurs. Again, the large extension of the lacrymal into the face, the small degree to which this bone enters into the orbital wall, and the position of the lacrymal fossa with its duct opening without the orbit, are further so-called Lemuroid features. It is the exception, however, among the subfossil forms which we have been studying for the lacrymal foramen to open distinctly on the face, and in many cases it is as much within the orbit as in certain genera of Monkeys. It is true that the lacrymal bone never extends so far within the orbit in either extant or fossil Malagasy Lemurs as to meet the ethmoid—there is always, so far as I have been able to observe, a fronto-maxillary suture of longer or shorter extent,—but in *Palæopropithecus* and

Archæolemur there is a very considerable downward extension of the lacrymal in a manner very analogous to the condition seen in certain American forms (text-fig. 48).

Dr. Forsyth Major has in this connexion made a laborious comparison of many hundreds of skulls of Lemurs and Monkeys, and even before the discovery of the new forms described in this memoir had already come to the conclusion that neither this character nor the position of the lacrymal foramen can be used as differentiating

Text-fig. 48.



Showing shape and extension of lacrymal bone within the orbit and position of lacrymal foramen in various Lemurs and Monkeys:—1. Young *Palæopropithecus*; 2. *Archæolemur edwardsi*; 3. *Mesopropithecus pithecoides*; 4. *Mycetes palliatus*; 5. *Callithrix personata*; 6. *Propithecus edwardsi.*

characters (see text-fig. 48 *). Forsyth Major has also shown that even in the extant Indrisinæ the ethmoid enters to a small extent into the orbital wall, while some non-Malagasy genera have a large *os planum*. There is no doubt that the large size of the orbits of many Lemurs is a character due entirely to their nocturnal habits. This feature is absent in some of our fossils, but appears in some of the Lemur-like South-American nocturnal Monkeys (text-fig. 49).

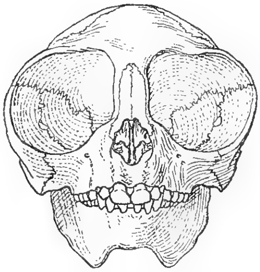
Temporal Region.—The high, strong zygomatic arch of the majority of the fossil Malagasy Lemuroids has certainly no close analogy with the ordinary condition of this region among the Apes. Is it not probable, however, that this feature is in relation with the heavy jaws, stout temporal muscles, and vertical occiput which have been referred to above? In the higher Apes the expanding of the cranial vault and shortening of the region between the *foramen magnum* and the posterior margin of the palate has brought about a corresponding shortening of the zygomatic arch.

* Nos. 4, 5, 6 are taken from the illustrations to the study by Dr. Forsyth Major above alluded to.

That a vertical occiput and heavy mandible may even in a Monkey be associated with long stout zygomata is seen in the case of the "Howlers" of South America (text-fig. 46, A).

The Basilar Region.—The presence of prominent auditory bullæ on the base of the skull is considered by some writers as a distinctive Lemuroid feature, but in *Palæopropithecus* this character is entirely absent. As previously stated, this is probably a secondarily acquired character, and cannot be urged as an argument for

Text-fig. 49.



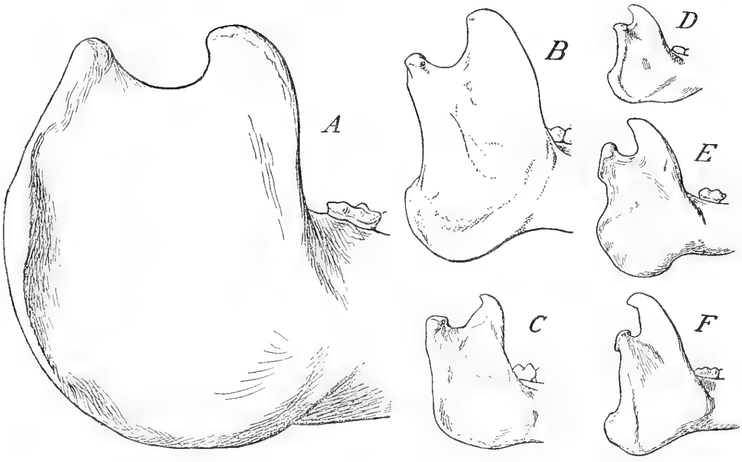
Front view of skull and mandible of *Nyctipithecus*, showing large Lemur-like orbits (*cf.* text-fig. 16).

specially connecting *Palæopropithecus* with the Cercopithecidæ and higher Apes. But in *Megaladapis* the bullæ are by no means prominent; and since the two American families both exhibit this feature it can hardly be urged as a peculiarity of the Lemurs.

The Mandible.—Several characters of the mandible of *Archæolemur* and *Mesopropithecus* have been referred to in the detailed description of these fossils as allying them with the Apes, and need not here be recapitulated. Reference should be made, however, to one or two features urged by Milne-Edwards and Grandidier as differentiating the mandible of the Indrisinæ from the higher Primates. They state that the coronoid process is much higher than the condyle. This is of course true in the case of the three existing genera; but a comparison with the mandibles of the various fossil relatives of the Indrisinæ and with the American Monkeys shows that this character cannot be relied upon as a differentiating feature distinguishing between the Malagasy Lemuroids and the Monkeys (text-fig. 50).

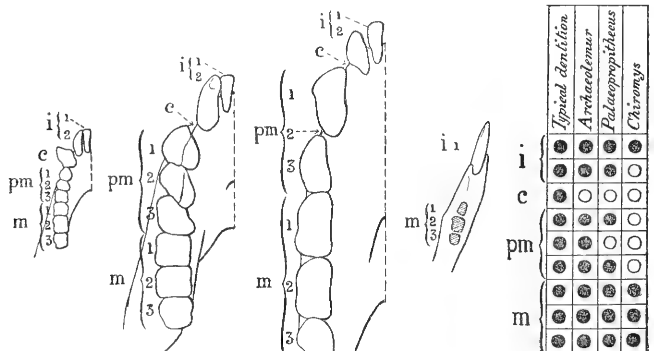
The Dentition.—The definite association of the recent Indrisinæ through *Mesopropithecus* with the Archæolemurinæ disposes of many of the objections raised against the Simian affinities of the extant genera, since the dentition of *Archæolemur* and *Hadropithecus* is distinctly Ape-like in character. It is just on the question of the dentition, however, that there seems least *prima facie* reason for maintaining the

Text-fig. 50.



Showing comparative height of condyle and coronoid process in mandibles of various Lemurs and Monkeys:—A. *Palæopropithecus maximus*; B. *Archæolemur majori*; C. *Semnopithecus*; D. *Nyctipithecus*; E. *Propithecus*; F. *Hapalemur*.

Text-fig. 51.



Showing progressive deviation from the "generalised" Primate formula among the various genera of Indrisidæ:—A. "Generalised" formula as seen in mandible of *Pithecia*; B. Mandible of *Archæolemur*; C. Mandible of *Palæopropithecus*; D. Mandible of *Chiromys*. On the right the same facts are shown in diagrammatic form.

close connexion between the living and extinct genera, which practically all the other features of their skulls bear witness to. It is desirable to examine this question closely. The following considerations may help us to a clear understanding of the subject.

There is, according to Milne-Edwards and Grandidier, evidence in the milk-dentition of the mandible of *Indris* and *Propithecus* that the original formula of these genera was $\overline{\text{i. }2:\text{ c. }1:\text{ p. }3:\text{ m. }3}$, which is the typical "generalised" dentition of the Primates, retained by the Lemuridæ and the Cebidæ. It is considered that by the non-replacement of one (the second) premolar and the canine the adult dentition is arrived at. There is here, at any rate, evidence of specialisation. Now *Archæolemur* has gone one step in the same direction; and assuming that the adult dentition of *Indris* and *Propithecus* is correctly described by the formula $\overline{\text{i. }2:\text{ c. }0:\text{ p. }2:\text{ m. }3}$, we may certainly write that of *Archæolemur* $\overline{\text{i. }2:\text{ c. }0:\text{ p. }3:\text{ m. }3}$. Both genera are similarly specialised, though *Indris* and *Propithecus* have gone further than *Archæolemur*. *Chiromys* is the extreme example of this reduction of the dentition among the Indrisidæ (see text-fig. 51).

A possible reason why *Archæolemur* has retained its three premolars in both the upper and lower jaws is that in these animals the premolars form continuous sharp blade-like edges which have evidently been used as shears. The retention of all the premolars and their functional importance in the upper jaw of *Archæolemur* appears to be the cause why the series of molars is pushed far back beyond the ordinary limits of the palate, the posterior margin of which takes on a deep hypsiloid shape.

But two further objections may be urged against the probability of any close connexion between the dentition of *Archæolemur edwardsi* and the existing Indrisinæ. The first is the fact that the molars of the former genus are square flat-crowned teeth destitute of the pointed cusps so characteristic of the Indrisinæ. This objection has little weight, however, when it is realised how readily one form of tooth passes into the other. One has only to examine the dentition of the various species of Macaque Monkeys to find examples quite as striking as the one under consideration.

It still might be urged that the lower incisors of *Archæolemur* do not show the curious pectinate form and procumbent disposition so characteristic of existing Lemurs. To this it may be replied that the incisors of *Archæolemur majori* do in fact show the early stages of this condition. The outer pair are curved inwards towards their extremity, so as to bring their edge into line with those of the inner pair, the whole four forming a scraping or rasping tool which in its more perfect form is seen in *Indris* and *Propithecus*. A still further stage of procumbency is seen in the true Lemurs. The same procumbent disposition of the lower incisors and incipient transformation into the tool described may be seen in certain species of Monkeys (text-fig. 12, p. 81).

It should also be remarked that in *Palæopropithecus*, the dentition of which is undoubtedly Indrisine, the lower incisors do not take this pectinate arrangement, but are strong cylindrical teeth (Plate X.). The angle of the mandibular symphysis of *Palæopropithecus* again may be compared with that of some of the American forms.

It seems necessary before concluding this section to say a few words as to the possibility from a geological point of view of the existence in Madagascar during Tertiary times of the Ape-like animals postulated by the foregoing argument. In the absence of the direct evidence, either positive or negative, which the discovery of Tertiary Primate remains either in Madagascar or on the African continent might be expected to supply, we must be content with showing that there is strong presumptive evidence for the truth of the hypothesis here advanced.

There are certain main facts which, broadly speaking, are generally accepted by geologists, though there are still divergences of view as to detail. In the first place, there is evidence of an ancient land-connexion between Africa, Madagascar, and India on the one hand, and between Madagascar, Africa, and South America on the other. In summing up the biological evidence as to the former continuity of land between Africa and India, Dr. Blanford says *: "So far as I am able to judge, every circumstance as to the distribution of life is consistent with the view that the connexion between India and South Africa included the Archæan masses of the Seychelles and Madagascar, that it continued throughout Upper Cretaceous times and was broken up into islands at an early Tertiary date." With this the recently expressed views of French palæontologists are practically in harmony. Mons. Trouessart says: "Je fais volontiers l'abandon, avec Mons. Boule, de toute relation continentale avec l'Inde *à partir de la fin du Crétacé,* car l'étude de la faune Malgache n'exige nullement cette supposition."

On the other hand, there seems evidence of a more recent connexion of Madagascar with Africa. Baron, who has recently studied both the botany and geology of Madagascar, comes to the conclusion that Madagascar was probably "joined to the African continent during some part or parts or the whole of the Miocene (including Oligocene) and early Pliocene periods." Baker also, from a comparative study of the floras of Madagascar and of Africa, concludes that there must have been a warm period during which (or some part of it) Madagascar was joined to the continent of Africa and also to Mauritius, Bourbon, and the Seychelles.

The evidence of a former land-connexion between Africa (including Madagascar) and South America is even more striking. Without entering minutely into the details of this evidence, a few facts relating to various groups of animals and plants may be quoted. Thus among Lacertilia two genera of the typical American family of Iguanidæ occur in Madagascar. Two genera of Amphisbænidæ are represented both in Africa and S. America. The Snakes especially give strong confirmation of the former connexion of these land-areas; in fact, to quote from Dr. Blanford, "the Ophidian

* Presidential Address Geological Society, 1890.

fauna of Madagascar is very much more American than African." The Batrachians and Mollusca again give further evidence tending in the same direction.

Turning now to the floras of the two regions, we find, according to Baron, that there is a distinct though slight affinity between the plants of Madagascar and those of America. Thus the genus *Omphalea* (Euphorbiaceæ) includes eight species, of which seven are found in Tropical America and one in Madagascar. Of the genus *Pedilanthus* (the same order) two species are found in Madagascar, and all the rest (about a dozen) in Tropical America. The well-known Travellers' Tree (*Ravenala madagascariensis*) finds its representative in *Phenacospermum guianense* (really a species of *Ravenala*), which inhabits Northern Brazil and Guiana and is the only other species. No doubt similar instances might be multiplied.

Once more to quote from Dr. Blanford a concise deduction from the facts bearing on this subject, we may conclude that "the biological evidence of former land-connexion between S. America and Africa is much stronger than that in favour of a belt between Africa, Madagascar, and India, though this latter is supported by geological data. It is probable that the land-barrier across the S. Atlantic, if that was the form of union, lasted to a later geological epoch than that across the Indian Ocean."

Without attempting to discuss the exact limits at various epochs of this great southern land-mass referred to by different writers under various names, it is sufficient for my present purpose to recognise that such an area existed.

Now, if we seek to know the nature of the fauna inhabiting this great southern Africo-American continent, it is evident that the only quite satisfactory source of information is the evidence from late Secondary or early Tertiary fossils. But a comparison of allied forms common to two or more isolated regions formerly included within the limits of this continent will furnish valuable inferences as to the probable character of their common ancestry. In Madagascar we have a large area of land which apparently has been almost untouched by late arrivals from the African continent.

It is, then, from the study of the existing fauna of Madagascar and its affinities with African and South-American forms on the one hand, and from the examination of the early Tertiary fossils of South America on the other, that we can best form an idea of the character of the forms of animal life existing on this ancient continent. In order to simplify the argument, the only group which we need here consider is the order of the Primates.

Now in the Santa-Cruz beds, which are probably of Oligocene date, we already have, according to Ameghino, clear evidence of the existence of well-differentiated Simiæ. These were not merely Ape-like Prosimiæ, but four genera of Monkeys closely allied to the extant Cebidæ. At the time of the last connexion of Madagascar with Africa (or possibly the eastern part of Africa), which, as we have seen, was probably during middle Tertiary times, the climate of South Africa (including Madagascar) was apparently tropical, since it was at this period that the tropical African plants spread into the regions now represented by the Mascarene Islands. If, then, there were, as early as Oligocene times, well-differentiated Simiæ inhabiting South America, and if at the same, or even a somewhat earlier, epoch there was extensive land-connexion with a South-African region enjoying a tropical climate, is there not a strong presumption that there were already in this African region Primate forms not necessarily identical with, but closely allied to those of S. America? That this African Primate stock was, before the separation of Madagascar from the mainland, far advanced towards the possession of the essential Simian characteristics seems to me probable. That it might, however, have retained on the one hand certain primitive Prosimian characters, and on the other have acquired certain features now distinguishing the Old World Monkeys rather than those of South America, is quite possible.

There is another argument which points in the same direction. The sudden appearance in Europe during Miocene times of such well-differentiated and highly-evolved forms as *Dryopithecus*, *Pliopithecus*, and *Pliohylobates*, has often puzzled geologists. But is it not extremely probable that these Simians, as suggested by Tullberg and others, migrated into Europe from Africa along with various other groups of mammals at the time of the re-establishment of land-connexion between the Palæarctic and Ethiopic regions? But this would certainly imply that for long ages before their appearance in Europe their evolution had been in progress in some part or parts of the southern land-mass. And even should it prove necessary to put back to an earlier date * than that assigned by Baron the last connexion between Madagascar and the mainland, it would still seem quite possible that a Prosimian stock, which as early as Oligocene times had produced forms so highly evolved as the Cebidæ of the Santa-Cruz beds, should in the South African region at the epoch of the last separation of Madagascar from the mainland have reached a stage of evolution which would account for all the Anthropoid features of our fossils.

Briefly to sum up the foregoing argument:—

(1) We have evidence of long-continued land-connexion between Madagascar and South America. This connexion possibly lasted till the end of the Secondary and well on into the Tertiary period.

* The problem is complex because one has to account on the one hand for the presence in Madagascar of such late forms as the Hippopotamus and Wild Hog, and on the other for the absence of various groups of mammals which were in existence at an earlier date on the African continent. Dr. Blanford's suggestion that the Bush-Pig found in Madagascar swam across a channel ten miles wide and found its way to the island of Madagascar, appears to me extremely improbable, especially as one has to account for the existence in the island at the present time of several distinct species. A much more probable explanation would seem to be that a low-lying isthmus covered with dense jungle and intersected by swampy tracts connected Madagascar with the mainland. Such a tract of country would offer but little obstacle to the passage of the Wild Pig, but would form an effectual barrier to the incursion of almost all other mammals, though purely arboreal animals like Monkeys would find little difficulty in also traversing such a region.

(2) Madagascar has been joined to the mainland for a lengthened period at a later date, possibly as late as the Miocene epoch.

(3) There is strong presumptive evidence that on this southern land-mass there was during the Eocene period a race, or races, of Primates which had already acquired most of the distinctive Simian characters. This evidence is two-fold: (*a*) In the Oligocene of Santa Cruz several genera of well-differentiated Cebidæ have been found. (*b*) By the Miocene epoch the Simian stock on the African Continent had already produced many highly developed forms, having all the chief features of the Old World Monkeys. The inference is strong that the race or races of Primates isolated in Madagascar at the time of its severance from the mainland would already have acquired most of the characteristic features of the "Anthropoidea."

(4) This ancestral Malagasy stock might, at the time of its isolation, be expected to have certain characters showing its affinity with both the Cebidæ and the Old World Monkeys.

(5) The subsequent history of these Malagasy Primates has apparently been one of arrested development or actual retrogression so far as the condition of the brain is concerned *, while adaptive modifications have arisen in most of the genera tending still further to disguise their pithecoid affinities.

It will have been noticed in the preceding descriptive sections that while in the main the affinities of these recently-discovered Malagasy fossils are with the Primates of South America, there are, nevertheless, certain features which find their closest analogy in various Old World forms. Thus the strong large vertical upper incisors of *Archæolemur* are almost identical with those of various African genera (see text-figs. 11 & 12). It may be said that this is merely a case of convergence, but it seems to me more probable that the primitive Indrisine stock all possessed these strong upper incisors. It is not very easy to conceive how *Chiromys*, if it had originally only the weak incisors of modern Lemurs, should have developed the very large and strong rodent-like teeth which at present characterise it.

In text-fig. 52 some of the results arrived at in the foregoing comparative survey are shown in diagrammatic form. On the two sides of the figure many of the so-called Anthropoid and Lemuroid characters are contrasted, and by the varying proportions of the black and tinted areas under the names of the different genera an attempt has been made to indicate the extent to which the various characters are present in these typical forms. Where a "Lemuroid" character is present in some one or more genera of Old or New World Monkeys, this has been shown in the two right-hand columns of the diagram, and the accompanying numerical references indicate where such character has been observed. It is very noticeable how many of these so-called Lemuroid

* Note.—The cerebral degeneration of such forms as *Palæopropithecus* and *Megaladapis* of course implies a *previous evolution* to that higher state from which they have degenerated. It seems more reasonable to suppose that this previous evolution should have taken place under very different conditions from those which have produced the subsequent retrogression and also *at a much earlier date.*

"LEMUROIDEA"							"ANTHROPOIDEA"		
"LEMUROID" CHARACTERS (TINTED)	*LEMUR*	*PROPITHECUS*	*MEGALADAPIS*	*ARCHAEOLEMUR*	*MESOPROPITHECUS*	*PALAEOPROPITHECUS*	PLATYRRHINE APES	CATARRHINE APES	"ANTHROPOID" CHARACTERS (BLACK)
vertical occiput							1		inclined occiput
long narrow condyles									short round condyles
large orbits							2		small orbits
everted orbits									forwardly directed orbits
lacrymal foramen on face								13	lacrymal foramen in orbit
horizontal frontal							3		steeply inclined frontal
long muzzle								14	truncated muzzle
long nasals							4		short nasals
large nasal chamber							5		small nasal chamber
upper incisors small or wanting							6		large upper incisors
upper incisors separated									incisors meeting on median line
procumbent lower incisors							7		vertical cutting incisors
no post-orbital wall									complete post-orbital wall
long flattened zygomata							8		short zygomata
prominent auditory bullæ							9		no auditory bullæ
no auditory meatus							10		an auditory meatus
persistent cranial sutures									obliterated cranial sutures
small round mandibular condyles							11		large cylindrical mandibular condyles
weak symphysis									ankylosed symphysis
much inclined symphysis							12		nearly vertical symphysis

characters are present to a greater or less extent among the Platyrrhine Monkeys. No doubt a more extensive survey would reveal other examples.

Such a diagram cannot be more than approximately accurate, but at any rate it is very evident that it is quite impossible on the strength of the characters here enumerated to draw any dividing-line between the two "sub-orders."

Some of the facts adduced by Dr. Elliot Smith in his memoir on the brain-casts of *Mesopropithecus*, *Palæopropithecus*, and *Lemur majori* seem to me strongly to confirm the views advanced in the foregoing sections. That the brain of *Perodicticus*, for instance, should reproduce almost exactly the furrow-pattern of a genus of Cebidæ appears a fact of extraordinary interest when we realise that possibly the whole of the Tertiary and Recent geological epochs have intervened since the divergence of the stems which gave rise to these widely-separated genera. That this is no chance resemblance seems also confirmed by the further statement of Dr. Elliot Smith that the histology of the brain-cortex of the Lemurs and Apes shows a complete bridge of transitional forms between the two "sub-orders."

It must be remembered that the real relationships of many of the genera of the Lemuridæ outside of Madagascar are probably much disguised by the adoption of a nocturnal mode of life. The extraordinary development of the orbits of *Tarsius* resulting from this cause seems to have modified the shape of the whole anterior part of the brain-case. The strangely flattened skull and everted upturned orbits of some of the Lorisinæ recalling the Eocene Prosimiæ is again probably largely a secondarily acquired condition depending on their mode of life. This seeming reversion by specialisation and retrogression to a lower and more primitive type is well seen in *Megaladapis* and *Palæopropithecus*.

The facts and considerations adduced in this memoir together with the results arrived at by Drs. Forsyth Major and Elliot Smith as the outcome of similar comparative study, seem to me to warrant our arriving at the following conclusions :—

General Conclusions concerning the Relationships of the Lemurs.

1. The recent Indrisinæ, *Chiromys*, *Mesopropithecus*, *Palæopropithecus*, *Archæolemur*, and *Hadropithecus*, are all more or less specialised representatives of one common Primate stock. These related genera may be conveniently grouped in one family—the Indrisidæ.

Text-fig. 52 (p. 160).—Diagram showing how many of the so-called distinguishing features of the Lemurs fail, when applied as differentiating characters, to distinguish between the two "sub-orders" of Lemuroidea and Anthropoidea. The ratio of the black to the tinted area in the small squares represents approximately the extent to which "Anthropoid" and "Lemuroid" characters respectively are present in the genera named at the head of the vertical columns. The reference numbers in the two right-hand columns indicate some of the various genera or species of Monkeys in which so-called Lemuroid characters may be observed, viz. :—1. *Mycetes*; 2. *Nyctipithecus*; 3. *Alouatta*; 4. *Pithecia*, *Cebus*, *Mycetes*; 5. *Mycetes*; 6. *Chrysothrix*; 7. *Pithecia*, *Jacchus*; 8. *Mycetes*; 9. *Cebidæ*, *Hapalidæ*; 10. *Cebidæ*, *Hapalidæ*; 11. *Pithecia*, *Nyctipithecus*, *Brachyteles*; 12. *Pithecia*, *Jacchus*, *&c.*; 13, 14. *Papio*. (This list is by no means exhaustive.)

Note.—The validity of this comparative survey is independent of the question whether the pithecoid features of the Malagasy Lemurs are ancestral or acquired by "convergence."

2. There is strong presumptive evidence that at the time of their isolation in Madagascar by the severance of that island from the mainland the ancestors of the Indrisidæ had already acquired most of the features generally regarded as characteristic of the true Monkeys.

3. During the subsequent history of the Indrisine group specialisation has taken place in various directions and to very varying degrees. Among the different genera enumerated above, *Archæolemur*, *Hadropithecus*, and *Mesopropithecus* have retained on the whole the greatest number of pithecoid characters.

4. Even some of the least specialised forms have undergone retrogressive changes as compared with the ancestral Tertiary stock from which they, in common with the extant Indrisinæ, are derived. This is notably true as regards the condition of the frontal region of the brain.

5. A comparison of the least specialised members of this Indrisine group of Primates with the various families of Monkeys shows relationships with both the Old and New World forms, but in several characters reveals closer affinities with the latter than with the former.

6. A comparison of the Malagasy Lemurinæ, recent and subfossil, with the various members of the Indrisine group supports the belief that among certain of these Lemurine genera specialisation has proceeded even further than in the case of the recent Indrisinæ. This specialisation has in general proceeded on similar lines in the two groups, though the deviations from the primitive dental formula are less pronounced among the Lemurine than among the Indrisine genera.

7. The members of the family of the Lemuridæ outside of Madagascar are found in scattered genera over a wide area in the Old World and bear the marks of a decadent group. All are nocturnal, and many are curiously specialised.

8. A comparison of the various genera of Lemuridæ with one another and with the New World Monkeys leads to a strong presumption that the different members of this family are all (with the possible exception of *Tarsius*) survivals of the Primate stock formerly inhabiting the ancient Southern land-mass which includes South America, Madagascar, and a part at least of South Africa and India. They are thus allied to the Malagasy Indrisidæ as well as to the Nyctipithecinæ and other South-American genera, and, more remotely, to the Old World Monkeys.

9. The terms *Lemur* and *Lemuroid* are misleading if they are intended to imply any close connexion between the recent Lemuridæ or Indrisidæ and such ancient Northern forms as *Adapis* and *Necrolemur*.

10. In view of the recent additions to our knowledge of the Lemurs and of their close relations to the Apes, it seems no longer necessary, or indeed possible, to separate the Primates into the two sub-orders of Lemuroidea and Anthropoidea.

APPENDIX.

On the Form of the Brain in the Extinct Lemurs of Madagascar, with some Remarks on the Affinities of the Indrisinæ. *By* G. ELLIOT SMITH, *M.A., M.D., F.R.S., Professor of Anatomy, The School of Medicine, Cairo.*

Received May 8, read May 28, 1907.

(Text-figures 53–63.)

IN this communication I propose to describe the features of the cranial casts of three extinct Prosimiæ recently found in Madagascar by Mr. H. F. Standing, who has given them the names *Lemur jullyi*, *Mesopropithecus pithecoides*, and *Palæopropithecus maximus*, respectively. I shall also seize the opportunity of adding some notes on the interpretation of the brain-casts of *Nesopithecus* and *Megaladapis* (which I have described elsewhere [1, 2, and 3]) in the light of new information which the study of these specimens and the histology of the brain in recent Lemurs has yielded.

With the help of the data which two of these three new casts supply, I hope to be able to demonstrate an undoubted affinity between the living Indrisinæ and *Chiromys*, and the extinct genera *Mesopropithecus*, *Palæopropithecus*, *Nesopithecus*, and *Megaladapis*.

In my former memoirs (1, 2, and 3) my chief aim was to enquire into the possibility of homologising cerebral sulci in the Primates and the other mammalian orders; and for this reason I endeavoured to apply to the furrows of the Prosimian brain, the Primate homologies of which are in most cases obvious, the names which it is customary to employ in describing the Carnivore, Ungulate, and other mammalian types of brain. How amply I was justified in this procedure everyone who is acquainted with the recent histological localisation of the cerebral cortex must be aware; but there is no need to continue the use of this nomenclature in the present instance, so I shall employ the common Primate terminology, which will not only eliminate contentious matter but also more readily facilitate the comparisons with the Apes, which will be discussed in the course of the description.

At the outset I must express my best thanks to Dr. A. Smith Woodward, Keeper of the Department of Geology in the British Museum, and Mr. Standing for the opportunity of examining these casts.

THE FORM OF THE BRAIN IN *LEMUR JULLYI*.

In my earlier memoir on the Prosimian brain (1) I was able to include some notes (pp. 336 and 337) on the features of the brain in *Lemur jullyi*, based upon the examination of a skull kindly lent me by Dr. Forsyth Major. The brain of that specimen was 10 mm. longer and 5 mm. broader than the largest example that I had obtained from a recent Lemur (of the species *varius*). The brain-cast with which we are at present concerned is even larger. The cerebral hemispheres are 66 mm. long (*i. e.* 7 mm. longer than Dr. Forsyth Major's specimen), 53 mm. broad (4 mm. more than the other), and 41 mm. deep. I have weighed a series of Lemurs' brains at various times and select the following as being those of adults weighed when perfectly fresh and before being put into any preservative fluid :—

	Brain-weights in grammes.	Body-weight.
1. *Lemur fulvus*, ♀	25·8	1970
2. „ *macaco*, ♀	27 1	1950
3. „ „ ♀	22·0	2110
4. „ „ ♂	26·0	2140
5. „ „ ♂	27·4	1720
6. „ „ ♂	28·9	1390
7. „ *varius*, ♂	39·0	2900

Max Weber records the following weights :—

8. *Lemur varius*, ♂	33·0	3399
9. „ „ ♀	28·7	2152
10. „ *mongoz*, ♀	28·0	2128
11. „ „ ♀	21·1	1266

The cranial capacity of the *Lemur macaco* whose brain weighed 26 grammes is exactly two-fifths the displacement (measured with sand) of the cranial cast of *Lemur jullyi*, so that in estimating its brain-weight as 65 grammes we cannot be far wrong. Thus we find that none of the Lemurs in the above list, with the exception of two of the three examples of *Lemur varius*, has a brain half as big as that of the extinct species.

For comparison I shall place side by side the measurements of the cerebral hemispheres of several Lemurs in millimetres :—

	Length.	Breadth.	Height.
Lemur jullyi	66	53	41
Lemur macaco (Flatau and Jacobsohn's measurement.)	48	38	28
Lemur macaco, ♀	43	37	26
Lemur fulvus	46	38	...
Lemur varius	49	42	...
Lemur jullyi (Forsyth Major's specimen.)	59	48	31

The features of this brain so closely conform to the same general plan as the other species of this genus that the descriptions and figures of the latter (I, pp. 326 and 327) which I have already published apply in most respects to the brain under consideration.

In proportion to its length this brain is considerably narrower and deeper than that of any of the living species. This is probably a primitive feature, because the same difference (in an even greater degree) is found in comparing the brains of the new-born and adult of existing Lemurs. This observation is based upon the comparison of six new-born Lemurs of the species *catta*, *macaco*, and *fulvus* with adults. All of this material was received from Captain S. S. Flower, Director of the Giza Zoological Gardens.

The narrowness of the hemispheres is most pronounced in the region in front of the Sylvian fissure: in comparison with the posterior parts the frontal poles of the hemispheres of *Lemur jullyi* are more slender and pointed than those of any living

Text-fig. 53.

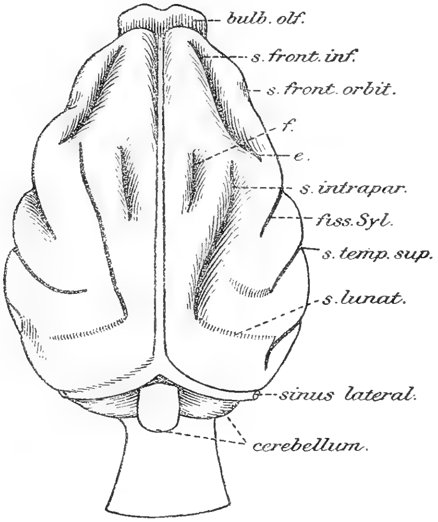


Diagram of the dorsal aspect of the brain of *Lemur jullyi*. Natural size.

Lemur. In this respect *Lemur varius* most resembles the extinct species; although the narrowness of the front portion of its hemispheres is not so pronounced as in the species *jullyi*, it is distinctly slenderer than that of the other living species (compare 1, figs. 1, 2, and 3, page 326).

Another noteworthy peculiarity of the brain of the extinct species is the very small size of the orbital depression on the inferior aspect of the frontal region of the hemisphere. In the different living species of *Lemur* the orbital area *often* extends almost as far back as the fissure of Sylvius and, *as a rule*, both the orbital and fronto-orbital [" diagonal " of my former memoirs, 1, 2, and 3] sulci are placed within it (see I, fig. 6, p. 330). Even in recent Lemurs of the same species these features are subject to considerable variation, and it often happens that the fronto-orbital [diagonal] sulcus is situated either partly or even wholly beyond the rim of the orbital depression. In *Lemur jullyi* the orbital depression extends barely half the distance from the frontal pole to the Sylvian fissure, and the fronto-orbital sulcus is placed on the outer face of the hemisphere 4 mm. behind the orbital margin (fig. 54). In these respects the brain under consideration resembles those of the family Lorisinæ. The orbital surface is very small in these Lemuroids, and, although the fronto-orbital sulcus does not usually,

Text-fig. 54.

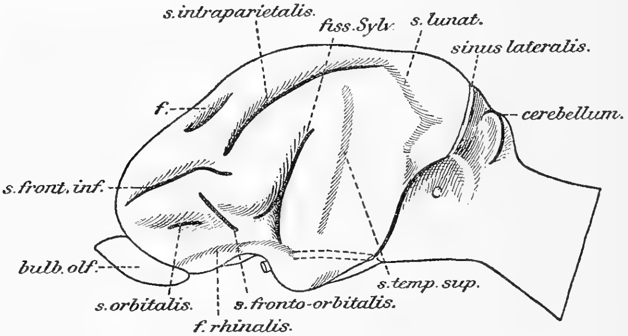


Diagram of the left lateral aspect of the brain of *Lemur jullyi*. Natural size.

if indeed ever, properly develop in them, we know (from the distribution of the claustrum and its relationship to the sulcus in other Lemurs—see I, fig. 60 *a*, p. 408) exactly where it would make its appearance, and that is in a situation exactly coinciding with the place actually occupied by the furrow in *Lemur jullyi*. In these respects the extinct species exhibits what is probably the more primitive and common Prosimian configuration, which the recent species have lost in varying degrees. It is specially worthy of note that all of the extinct Lemuroids—*Nesopithecus* (fig. 60), *Palæopropithecus* (fig. 63), and *Mesopropithecus* (fig. 59)—resemble *Lemur jullyi* (fig. 54) and the hypothetical primitive Prosimiæ in this respect. This is especially noteworthy in the case of the brain of *Mesopropithecus*, because in all other respects it is an almost exact replica of the organ in *Indris*.

The form of the olfactory bulbs, the pyriform lobes, the rhinal fissures, and the orbital, fronto-orbital [diagonal], inferior frontal [coronal], Sylvian, parallel [superior temporal or post-Sylvian], and intraparietal [lateral] sulci calls for no detailed account, since all of these features so closely resemble those of the recent Lemurs, which I have already described (I).

The fronto-orbital [diagonal] sulcus is exceptionally deep and cleanly cut and, together with the very clearly defined sulci emerging from the lower end of the Sylvian fissure, helps to map out the insular area with a distinctness that recalls the condition found in *Hylobates* and is only rarely met with beyond the limits of the Anthropoid Apes and Hominidæ (text-fig. 54).

There seems to have been in this brain an exceptionally extensive representative of the furrow which in my former memoir (1) I called "postlateral"—an identification which I have since proved to be absolutely exact, because this furrow, both in the Carnivora (in the brain of which this sulcus was first so-called) and in such Prosimiæ as *Lemur*, *Nycticebus*, *Perodicticus*, and *Propithecus*, forms the cephalic boundary of the visual cortex or *area striata*. This observation, which has not hitherto been published (except verbally at a meeting of the Anatomical Society on June 1st, 1906), has been recently confirmed in the case of *Nycticebus* by Oskar Vogt (4). I refer to this apparently irrelevant matter here to emphasise the fact that when the sulcus lunatus ["Affenspalte"] first makes its appearance in such lowly Cebidæ as *Pithecia* (3) it presents the same relationship to the area striata as the sulcus postlateralis exhibits in the Prosimiæ—a relationship which undergoes a progressive modification in the higher Cebidæ and the Cercopithecidæ as the result of the differentiation of the neopallial areas fringing the area striata and the deepening of the sulcus lunatus to accommodate these expanding strips of cortex. In other words, the sulcus lunatus [postlateralis] of the Prosimiæ, while retaining its similitude to and real identity with the postlateral sulcus of other mammals, presents a much nearer approximation to the condition found in the lowlier Cebidæ than the latter presents to the state of affairs met with in, say, *Cercopithecus*.

The transverse form of this postlateral sulcus and its separation from the lateral sulcus (compare 1, figs. 1, 2, and 3) seem to occur more often in the species *varius* than in other living Lemurs. In *Lemur jullyi* the direction of this furrow, obliquely downward and backward, recalls the form and relationship to the intraparietal [lateral] met with in the Carnivora and other non-Primate Orders.

Unlike the brain of *Lemur varius* (in which the sulci are unusually short, in spite of its large size) in the specimen under consideration all the sulci ever found in any Lemur's brain are developed to their full extent and are deep and cleanly cut.

The sulcus "*f*" of my earlier memoir (1) is exceptionally long and quite sagittal in direction. My recent histological work (and also that of Vogt [4]) and physiological experiments conducted by Dr. Page May and myself [see British Association Report, 1904, p. 760] have confirmed the suggestion made by Ziehen and by myself (1, p. 416) that the sulcus "*f*" is to be regarded as the upper part of the sulcus centralis. This is only true if we admit certain reservations. The sulcus "*f*" is called into being by the same factors which produce the upper part of the central sulcus; and in many Prosimiæ (*Perodicticus* and sometimes in *Nycticebus*, *Propithecus*, and *Chiromys*) the resultant furrow is an exact homologue of that sulcus; but in other cases it often assumes a direction oblique or even at right angles to that which the fully developed central sulcus assumes; in such instances there can be no question of any "homology" with the central, even though we are bound to admit that the causal factors which give rise to "*f*" and the central sulci are the same.

The brain of *Lemur jullyi* presents an extreme form of this eccentricity. For the sagittally directed sulcus "*f*" is at right angles to the line of the true central, *i. e.* to the caudal boundary of the excitable cortex.

The cerebellum is overlapped by the cerebral hemispheres to about the same extent as (or perhaps even a little more than) in recent Lemurs.

THE FORM OF THE BRAIN IN *MESOPROPITHECUS PITHECOIDES.*

In most respects this is a typical Indrisine brain. In fact, if it had been given to me without any information as to its source I should not have hesitated to identify it as the cranial cast of *Indris*. The fact that the fronto-orbital sulcus differs in position from that of the living Indrisinæ in exactly the same way as that of *Lemur jullyi* diverges from living Lemurs would not necessarily have excluded the possibility of this being the cranial cast of *Indris*, because it sometimes (though quite exceptionally) happens in *Lemur macaco* (and in other species) that the sulcus fronto-orbitalis is outside the orbital depression.

This cast displaces hardly any more sand than is sufficient to fill the cranium of the *Lemur macaco* the brain of which weighed 26 grammes. In attributing a weight of 27 or 28 grammes to this brain we cannot be far wrong.

The cerebral hemispheres were 56 mm. long, 45 mm. broad, and 30 mm. deep. Flatau and Jacobsohn's drawings* of the brain of *Indris brevicaudatus* represent a brain 53 mm. long, 43 broad, and 28 mm. deep. Thus the brain of *Mesopropithecus* is of similar shape and very slightly larger than this brain of *Indris*.

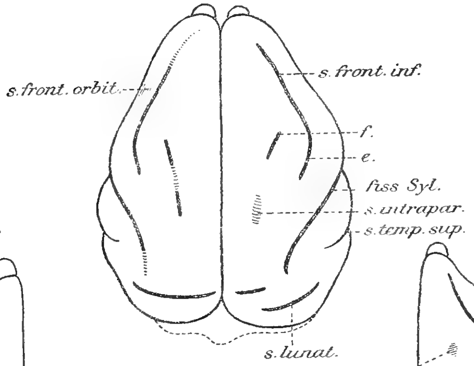
The fresh brain of a *Propithecus coquereli* (which died in the Giza Zoological Gardens and was kindly given to me by Captain Stanley Flower) was 51 mm. long, 45 mm. broad, and 35 mm. deep; and a cranial cast of *Propithecus diadema* measured 46 mm. long, 36 mm. broad, and 30 mm. deep.

Thus the brain of *Mesopropithecus* more clearly resembles *Indris* not only in the arrangement of its furrows but also in its size and proportions. The relative flatness of the brain of *Indris* as compared with *Propithecus* is found also in *Mesopropithecus*.

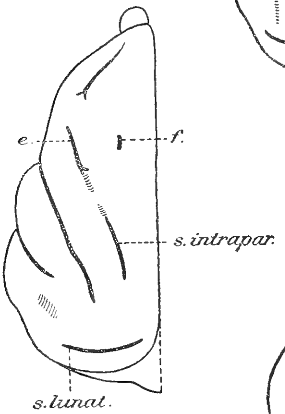
The furrows on the surface of this cast are deep and have widely separated lips. This deepness and openness of the sulci is also found in the living Indrisinæ. The arrangement of the sulci almost exactly reproduces the pattern exhibited in the cranium

* These are the only figures representing this brain available to me at present. Flatau and Jacobsohn attribute these drawings to Chudzinski; but I believe their original source is to be found in Grandidier's and Milne-Edward's "Histoire."

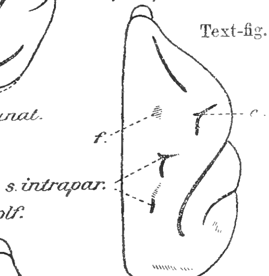
Text-fig. 55.



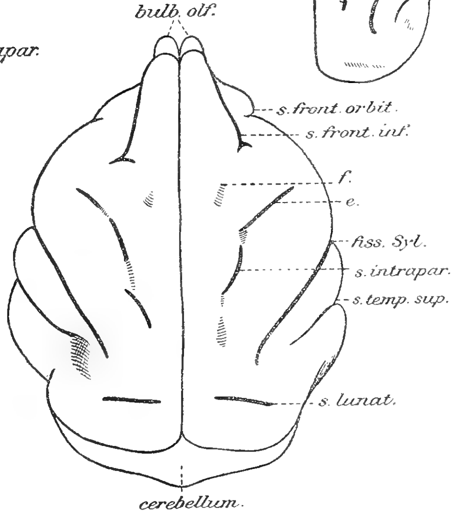
Text-fig. 56.



Text-fig. 57.



Text-fig. 58.



Text-fig. 55.— Diagram of the dorsal aspect of the brain of *Mesopropithecus pithecoides*. Natural size.
Text-fig. 56.—The dorsal aspect of the left cerebral hemisphere of an *Indris brevicaudatus*. Natural size.
Text-fig. 57.—The dorsal aspect of the right cerebral hemisphere of a *Propithecus coquereli*. Natural size.
Text-fig. 58.—Diagram to represent a restoration of the dorsal aspect of the brain of *Nesopithecus*.

of *Indris brevicaudatus* [No. 253 in the Museum of the Royal College of Surgeons, London], which I have figured in my previous memoir (1, fig. 30, p. 353).

The deep backwardly-prolonged Sylvian fissures, the parallel and the extensive deep postlateral sulci call for no special account, for they merely reproduce the arrangement found in *Indris* and often also in *Propithecus*. But the intraparietal and inferior frontal sulci call for more detailed study, if for no other reason, because they are subject to so much variability in the extant Indrisinæ.

Text-fig. 59.

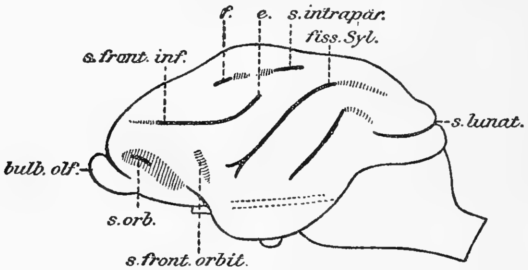


Diagram of the left lateral aspect of the brain of *Mesopropithecus pithecoides*. Natural size.

There is one feature that is curiously distinctive of the Indrisinæ; it is the imperfect development of the intraparietal [lateral] sulcus. In the genus *Lemur* and, in fact, almost all Primates this sulcus is deep and long; and in most other mammals this is one of the most constant and best developed furrows in the neopallium. In the Indrisinæ, however, it is often represented merely by one or two shallow depressions or at most a short sulcus, quite unlike the long deep furrow usually found in the genus *Lemur*. The backward extension and deepening of the Sylvian fissure, which are so marked in the Indrisinæ and especially in *Propithecus*, are present also in this extinct genus. An analogous but not altogether identical overgrowth of the Sylvian at the expense of the intraparietal sulcus is found also among the Prosimiæ in *Nycticebus* and in several of the Cebidæ—*Chrysothrix*, *Nyctipithecus*, *Aotus*, and *Alouatta*. In *Mesopropithecus* the intraparietal sulcus was a very short shallow depression, not more than 4 mm. long, placed just behind the mid-point of the hemisphere about 7 mm. from the mesial plane.

A few millimetres further forward there was a short slightly oblique sulcus "*f*." The inferior frontal [coronal] sulcus was long and deep with an upturned caudal extremity (fig. 59, *e*) as in many Lemurs and the specimen of *Indris* described by me (1, p. 353). In the brain of the young specimen of *Propithecus diadema* described by me (2) there is a similar inferior frontal sulcus, but in my specimen of the brain of *Propithecus coquereli* (fig. 57), as also in Grandidier's and Milne-Edwards's specimen of

Indris brevicaudatus (fig. 56), the inferior frontal is broken up into an anterior part (the true inferior frontal) and an irregular caudal part, the sulcus "*e*," which is related to the formation of the lower part of the sulcus centralis in the same manner as the sulcus "*f*" is related to its upper part (*vide supra*).

Thus occasionally in *Propithecus* and *Chiromys* and constantly in *Perodicticus* the furrows in the situations *e* and *f* come into line and fuse to form a true sulcus centralis such as we find in *Pithecia* and the Cebidæ [see the figures in my earlier memoir, 1].

It is interesting to note that in this specimen of *Mesopropithecus* this disruption of the inferior frontal sulcus has not occurred; hence the similarity of this brain to that of *Lemur* is much closer than is usual in the Indrisinæ.

In the form of the olfactory bulbs and the extent of the cerebellar overlap this brain resembles those of the living Indrisinæ.

The Form of the Brain in *Nesopithecus*.

It is convenient here to return to the consideration of the cranial casts of *Nesopithecus* (*Globilemur*), which I have described in my former memoirs (1, 2, and 3). My reason is that I am now able to discuss with more confidence the significance of

Text-fig. 60.

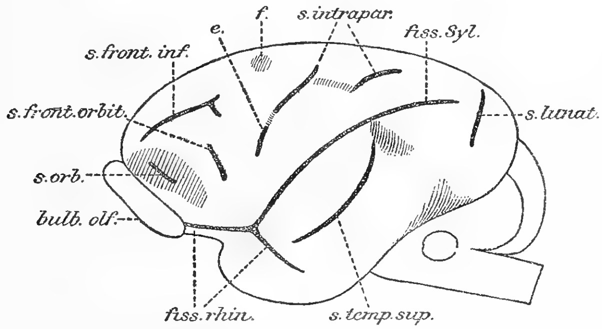


Diagram of a restoration of the left lateral aspect of the brain of *Nesopithecus*. Natural size.

the features of this brain, concerning which I felt the greatest hesitation in expressing an opinion before. The renewed study of the brain in the Lemurs has convinced me of the accuracy of the identification of the furrows of this brain in my former communications, and justifies me in discussing the bearing of the cerebral plan so revealed on the affinities of *Nesopithecus*.

A comparison of the cranial casts of *Nesopithecus* and *Mesopropithecus* on the one hand, and the brains of *Propithecus* and *Indris* on the other, makes it abundantly clear that the brain of *Nesopithecus* conforms to the Indrisine type. The greatly elongated Sylvian fissure and the shallow intraparietal [lateral] sulcus undergoing a process of disintegration into fragments indicate its Indrisine affinities beyond all question. All of the other features of the brain accord with this interpretation. The accompanying diagrams (fig. 58 and fig. 60), constructed from the data obtained from the examination of the complete cranial cast (1 and 3) and the two fragments (2), renders further discussion of this brain unnecessary.

The Form of the Brain in *Palæopropithecus maximus.*

The bulk of this brain is slightly more than four times that of the cranial cavity of the *Lemur macaco* the brain of which weighed 26 grammes; so that we can roughly estimate the size of this brain at 104 grammes. The largest recorded weights of

Text-fig. 61.

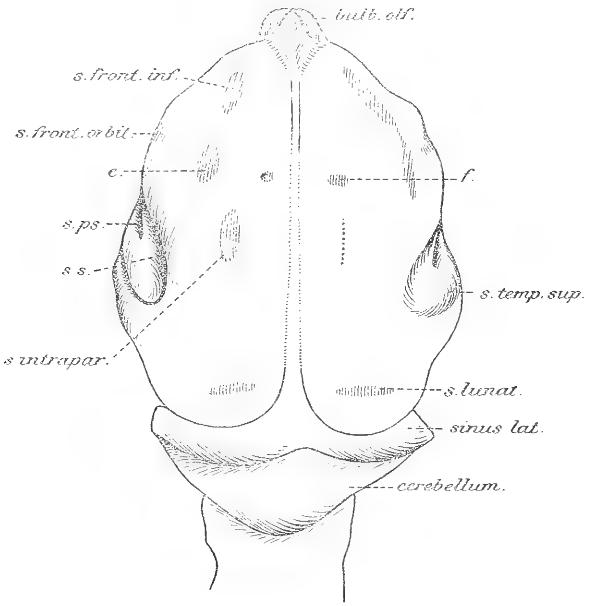


Diagram of the dorsal aspect of the brain of *Palæopropithecus maximus*. Natural size.

recent Lemuroids, that of a *Chiromys*, 42·95 grammes (Max Weber), and my *Lemur varius*, 39·0 grammes, are considerably less than half that of this large extinct genus.

In form this brain differs considerably from all other Prosimiæ except the existing *Chiromys* and the extinct *Megaladapis*: and in the case of these two the resemblance is something more than one of mere shape, for a closer examination reveals many points of identity in these three retrograde Lemuroids.

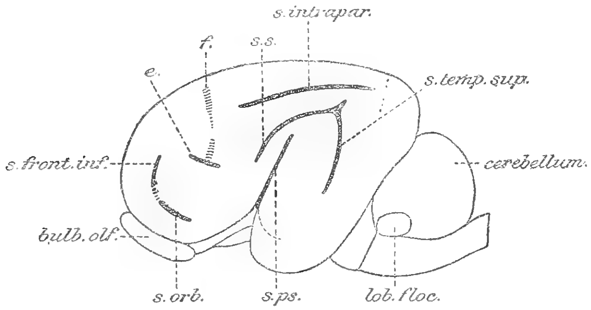
It is very unfortunate that the patterns of the sulci in this cast are more blurred and indistinct than in the other two casts (those of *Lemur jullyi* and *Mesopropithecus*), the resemblance of which to living genera renders the plan of the convolutions of less interest. However, sufficient can be seen of the furrows (or, rather, of the irregularities resulting from their presence) to enable us to map out the main features of their arrangement.

The hemispheres were 72 mm. long, 59 mm. (*i. e.* 29·5 each) wide, and 50 mm. deep.

The olfactory peduncles were narrow and elongated, like those of *Megaladapis*; but, without having seen the skull, I am unable to make any detailed statement on this point. The large cylindrical masses representing the maxillary and ophthalmic divisions of the trigeminal nerve prevent us from determining the position and relations of the optic chiasma, which are so peculiar in *Megaladapis*. However, this is a matter which the describer of the cranium can at once determine.

The anterior end of each hemisphere is blunt and rounded, as in *Chiromys* and *Megaladapis*, though in a lesser degree. The orbital area is very small, but there is a

Text-fig. 62.



Left lateral aspect of the brain of *Chiromys madagascarensis*. Natural size.

definite orbital margin, which has disappeared in the other two genera just mentioned. The retention of even this small orbital margin distinctly enhances the resemblance to the other Prosimiæ and enables us to interpret the features of the brain of *Chiromys* and *Megaladapis* with more certainty. Almost the whole length of the orbital surface is occupied by a deep orbital sulcus, and immediately above the orbital margin is the anterior end of the inferior frontal [coronal] sulcus. After examining such a brain as this it is easy to understand how, when the orbital margin is wiped out and there is nothing to prevent the confluence, the orbital sulcus joins the inferior frontal [coronal], as I have described and figured (1, figs. 33, 34, 35, and 36, pp. 356 and 357) in the case of *Chiromys*. It is not possible to say for certain whether or not the sulcus labelled *sco.* in my diagram of the brain of *Megaladapis* (1, fig. 42, p. 365) is also a conjoint orbito-coronal sulcus which has lost its curve and been bent back by the retraction of the frontal pole of the hemisphere, but this seems to be the probable explanation of the curious form of the hemisphere in *Megaladapis.*

In comparison with the other Prosimiæ, *Palæopropithecus* has departed least of the three and *Megaladapis* most from the primitive Lemuroid type in respect of this feature. In all three (*Palæopropithecus, Chiromys,* and *Megaladapis*) there is a noteworthy reduction in size of the frontal area of the hemisphere. The retraction of the front of cerebrum (which has resulted from this atrophy) has in *Palæopropithecus* brought the orbital area to the extreme antero-lateral margin of the hemisphere: in *Chiromys* it has moved a little further on to the pole of the hemisphere; and, finally, in *Megaladapis* the homologue of the orbital surface is probably placed partly on the *dorsal* aspect of the anterior extremity of the hemisphere.

Text-fig. 63.

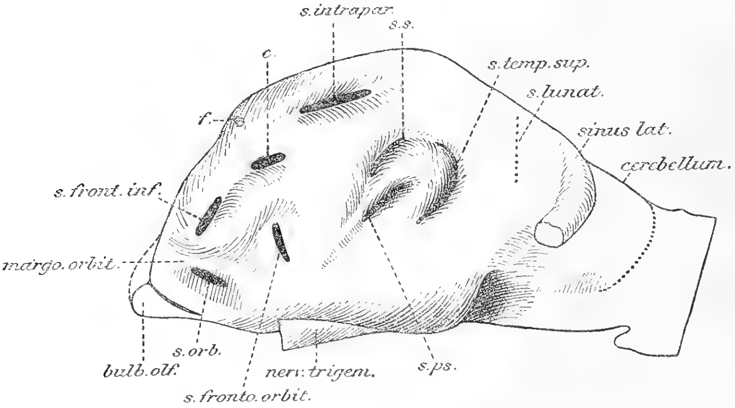


Diagram of the left lateral aspect of the brain of *Palæopropithecus maximus.* Natural size.

This seems to be the outstanding feature of these three brains—a (probably) secondary atrophy of the great frontal association-area, which is the latest part of the cerebral hemisphere to be evolved and the first to go when the brain undergoes a retrograde change.

The fronto-orbital sulcus, which is absent in both *Chiromys* and *Megaladapis,* is present in this brain in the position analogous to that which it occupies in *Mesopropithecus, Nesopithecus,* and *Lemur jullyi.*

There is the characteristically small intraparietal [lateral] sulcus of the Indrisinæ and (as also in some examples of *Propithecus* and *Indris*) the shallow inferior frontal [coronal] sulcus seems to be broken into two parts—the true inferior frontal and the sulcus "*e*."

One of the most interesting features of this brain is the conformation of the Sylvian region. In the left hemisphere we have an exact reproduction of that peculiar grouping of furrows which is found in the Primates only in *Chiromys* [see especially I, fig. 33, p. 356]. The apparent "Sylvian" sulcus is merely pseudosylvian (fig. 63, *s.ps.*), as this occurs in the Carnivora, and the inverted U-shaped furrow which surrounds its upper end represents a combination of the suprasylvian sulcus (anterior limb) with the postsylvian sulcus (posterior limb)—figs. 61, 62, and 63, *ss.* and *s.temp.sup.* respectively. The relations of the cerebellum to the hemisphere are like those of *Chiromys*.

On certain Affinities of the Indrisinæ.

The conclusions drawn by Dr. Forsyth Major ('Geological Magazine,' decade iv. vol. vii. No. 437, p. 494, November 1900) from the features of the teeth and skeleton agree so closely with the clear evidence of the cerebral characters that they are worth quoting here:—"As to the affinities of *Megaladapis* with other Lemuroids, I now hold that its specialisations are not a sufficient reason for its being removed into a separate family. There are in the first place undoubted affinities in the pattern of the cheek-teeth with *Lepidolemur* and also with the Indrisinæ. Relying chiefly on the vertebral column, Mivart long ago submitted that *Lepidolemur* 'seems to be that genus of the Lemurinæ which most approximates to the Indrisinæ.' In this I fully concur. . . . On the other hand, Winge has insisted on the relationship of *Chiromys* with the Indrisinæ, and in my opinion he is, as usual, right here also. It will thus be possible to show that these four groups, at first sight so very different from each other, because each of them is specialised in a different direction, are closely related to each other, and presumably had a common origin."

There are few assemblages of mammals that present such uniform brain-features as the Prosimiæ. The differences between the fundamental brain-types of the Lemurinæ and the Indrisinæ are surprisingly small. The larger species of Galaginæ present a type of brain which is almost identical with that of the Lemurinæ; while the primitive brain of Garnett's Galago and that of *Loris* have so many features in common that the gap between the Galaginæ and Lorisinæ is completely bridged; and on the other side the brain of *Microcebus* approaches near to that of *Tarsius*, by far the simplest and most pithecoid of all the Prosimiæ.

In my recent studies (as yet unpublished) on the distribution of the visual cortex in the Prosimiæ I have found in the genera *Propithecus*, *Lemur*, *Loris*, *Tarsius*, the Hapalidæ, and the Cebidæ a complete series of transitional stages leading up to the condition met with in the Old World Apes and Man. In this series the Hapalidæ come nearest to *Tarsius* on the one side and *Loris* on the other. But, in spite of the teaching of Hubrecht, the approximation of *Tarsius* to the Apes does not sever its even closer bond of affinity to the Lemurs. In all the Prosimiæ the constitution and grouping of the furrows of the neopallium are distinctly and unquestionably Primate: in no other mammals (with the possible exception of some of the Edentata) do we find a true Sylvian fissure; in no others (excepting possibly some primitive Carnivores) do we find the distinctive type of calcarine sulcus that occurs in both Lemurs and Apes: in no other group of mammals does a properly constituted central sulcus of the true pithecoid type tend to make its appearance, as it does in such diverse families as the Lorisinæ (*Perodicticus*), Indrisinæ (sometimes in *Propithecus*), and in *Chiromys* among the Prosimiæ: and turning to the evidence of the cerebellum we find in such a series as *Propithecus*, *Lemur*, *Loris*, *Tarsius*, and *Hapale* a complete bridge between the Lemurs and the Apes.

Conclusions.

1. The brain of *Lemur jullyi* closely resembles that of the existing members of the genus and especially the species *varius*, most of the differences that are found being explicable by the larger size of the extinct animal's brain.

2. The brain of *Mesopropithecus pithecoides* is an almost exact replica of that of *Indris*.

3. In the only features in which these two brains differ from those of their nearest living relatives they approach one another's type, as well as that of other Prosimian families, and to this extent can be said to be more primitive.

4. Neither brain can be said to be more pithecoid than those of their living relatives.

5. The brain of *Nesopithecus* [*Globilemur*] presents undoubted affinities to the Indrisine type. There is no feature or combination of characters which can be said to render this brain any more pithecoid than that of any other member of the Indrisinæ.

6. The brain of *Palæopropithecus maximus* is distinctly Indrisine. It exhibits an early stage of those retrogressive changes which we recognise in their ultimate and somewhat diversely specialised forms in the brains of *Chiromys* and *Megaladapis*.

7. Although *Chiromys* does not show any trace of the disintegration of the lateral sulcus, which is so characteristic of the Indrisinæ, it is linked by so many striking bonds of affinity to *Palæopropithecus* that it is impossible to separate them the one from the other or from the Indrisinæ.

8. So far as the evidence of brain-anatomy is concerned we must regard *Propithecus*, *Avahis*, *Indris*, *Mesopropithecus*, *Nesopithecus*, *Palæopropithecus*, *Chiromys*, and *Megaladapis* as the diversely specialised members of one family, all of which exhibit in greater or less degree distinct evidence of retrogressive changes from a more primitive (and also more pithecoid) type.

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All the other references in the present memoir are taken from my earlier work—No. 1 in the above list.

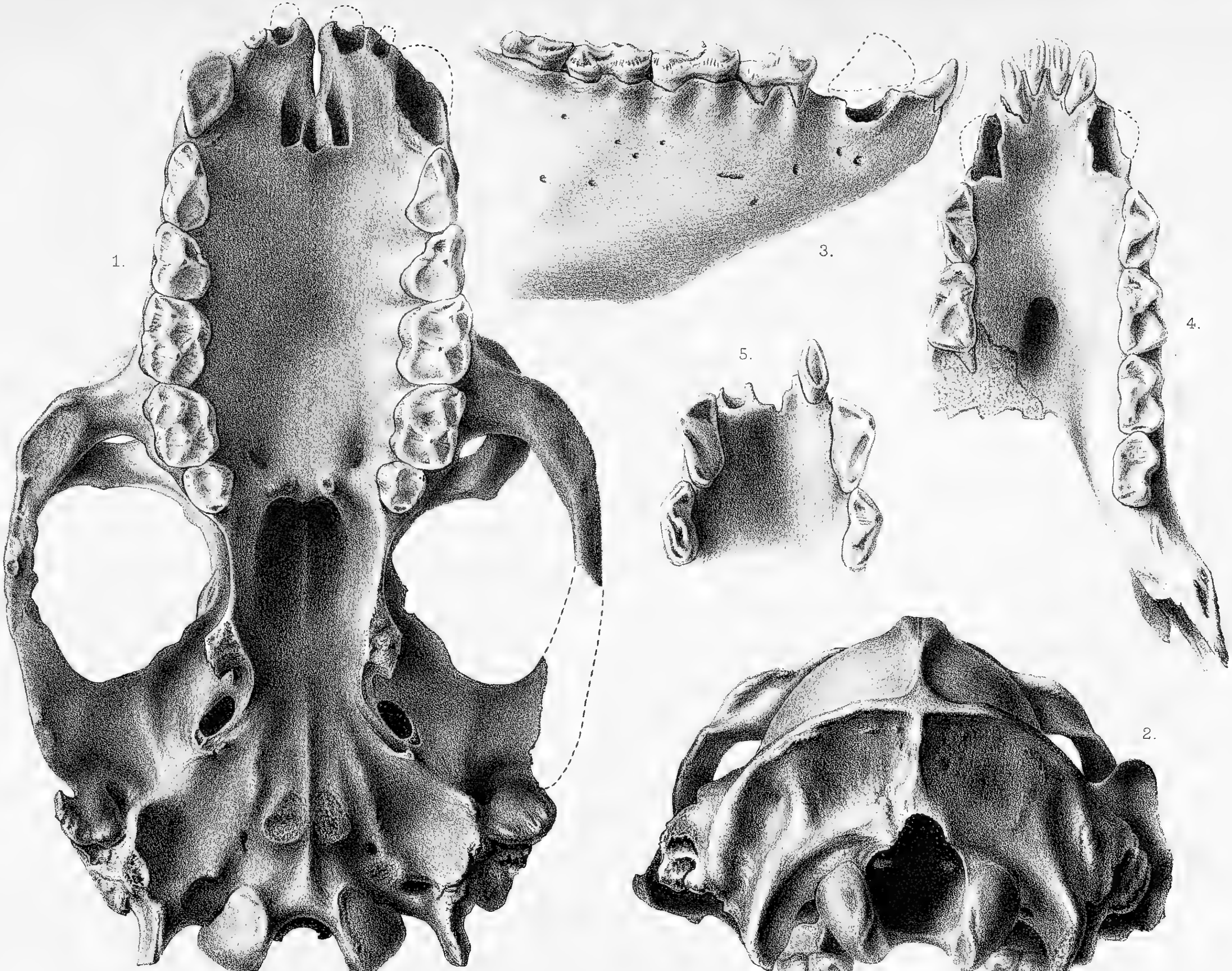
PLATE X.

PLATE X.

Palæopropitheeus maximus (Standing).

Fig. 1. Base of skull showing dentition of upper jaw.
Fig. 2. View of occiput.
Figs. 3–5. View of mandibles showing dentition of lower jaw.

All natural size.



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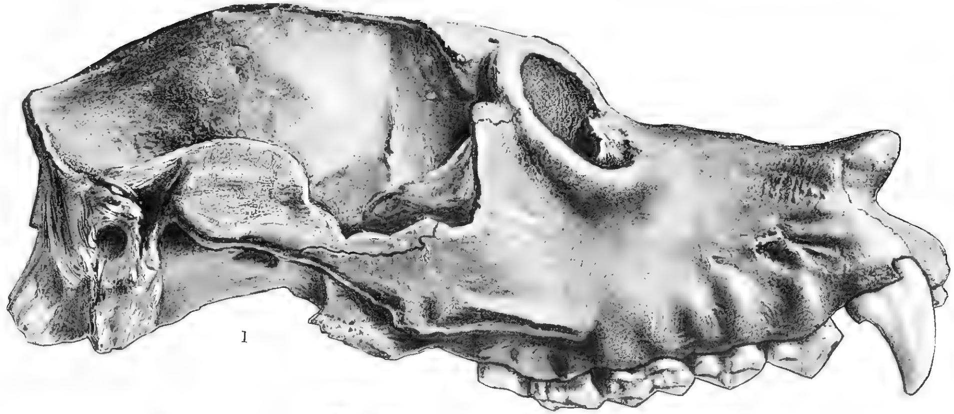
West, Newman imp.

PALAEOPROPITHECUS MAXIMUS.

PLATE XI.

PLATE XI.

Profile view of skull and mandible of *Palæopropithecus maximus*. $\times \frac{6}{7}$.



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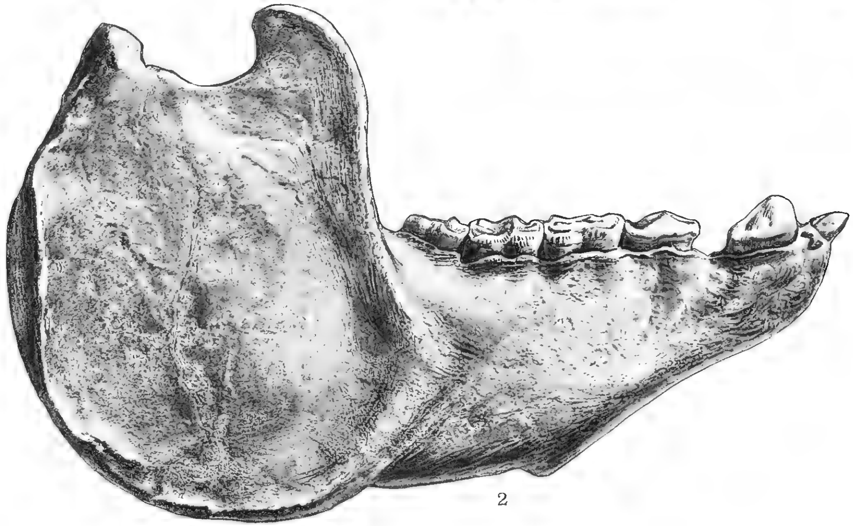

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$\times \frac{6}{7}$

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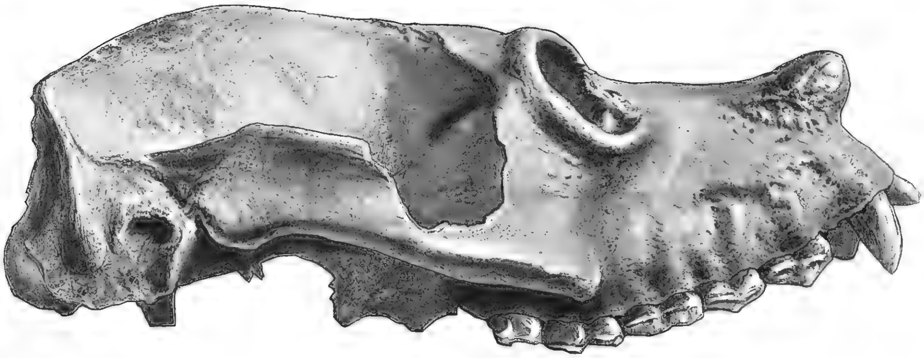
PALAEOPROPITHECUS MAXIMUS.

PLATE XII.

PLATE XII.

Profile view of six skulls of *Palæopropithecus maximus.* $\times \frac{4}{5}$.

1



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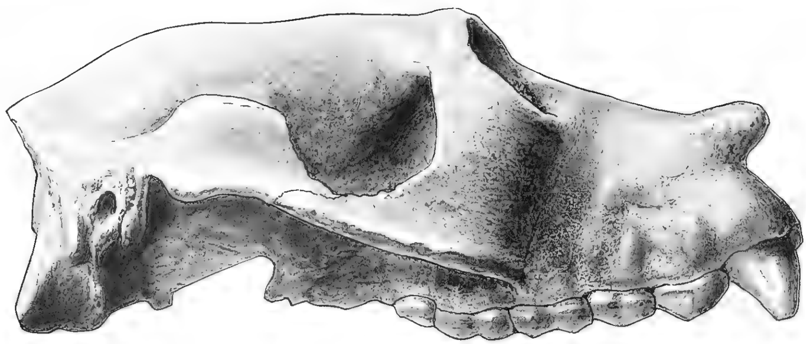

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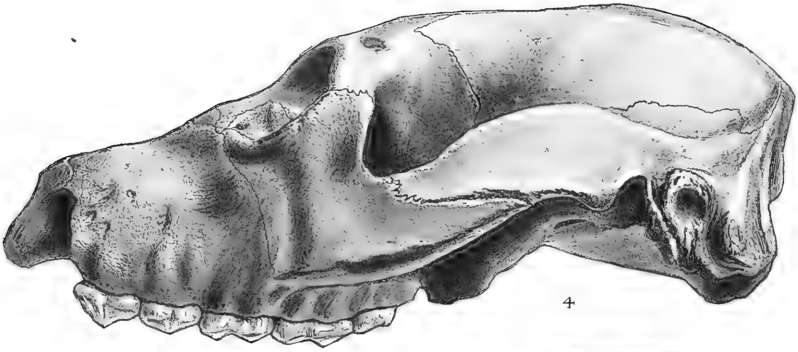
PALAEOPROPITHECUS



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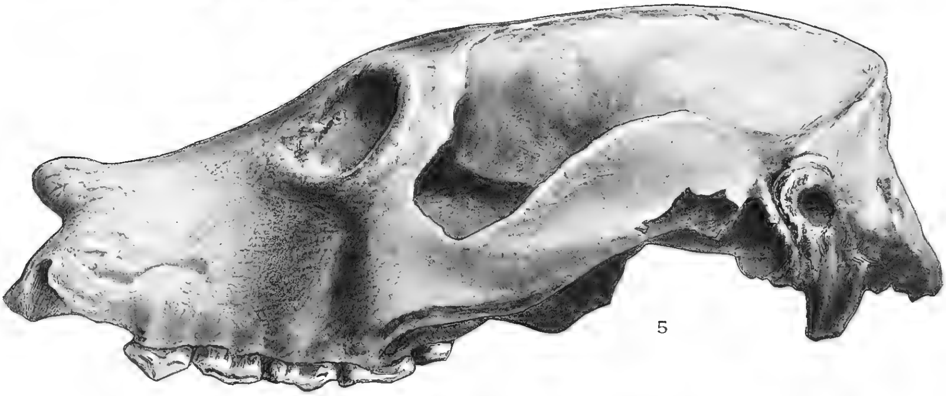

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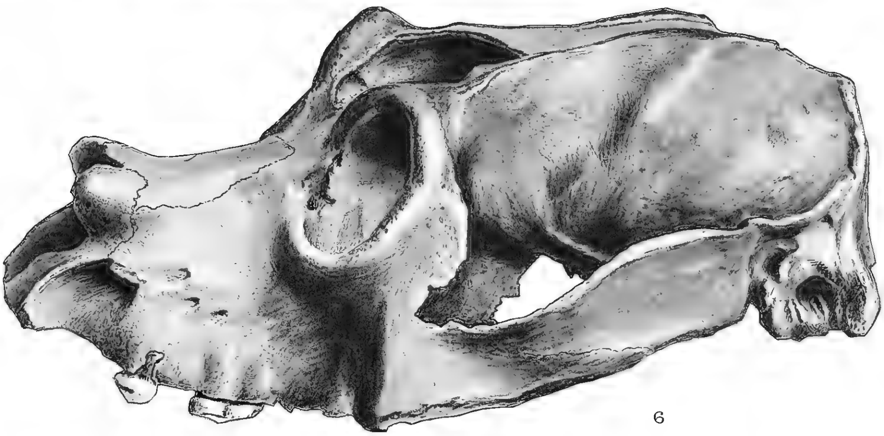

6

× $\frac{4}{5}$

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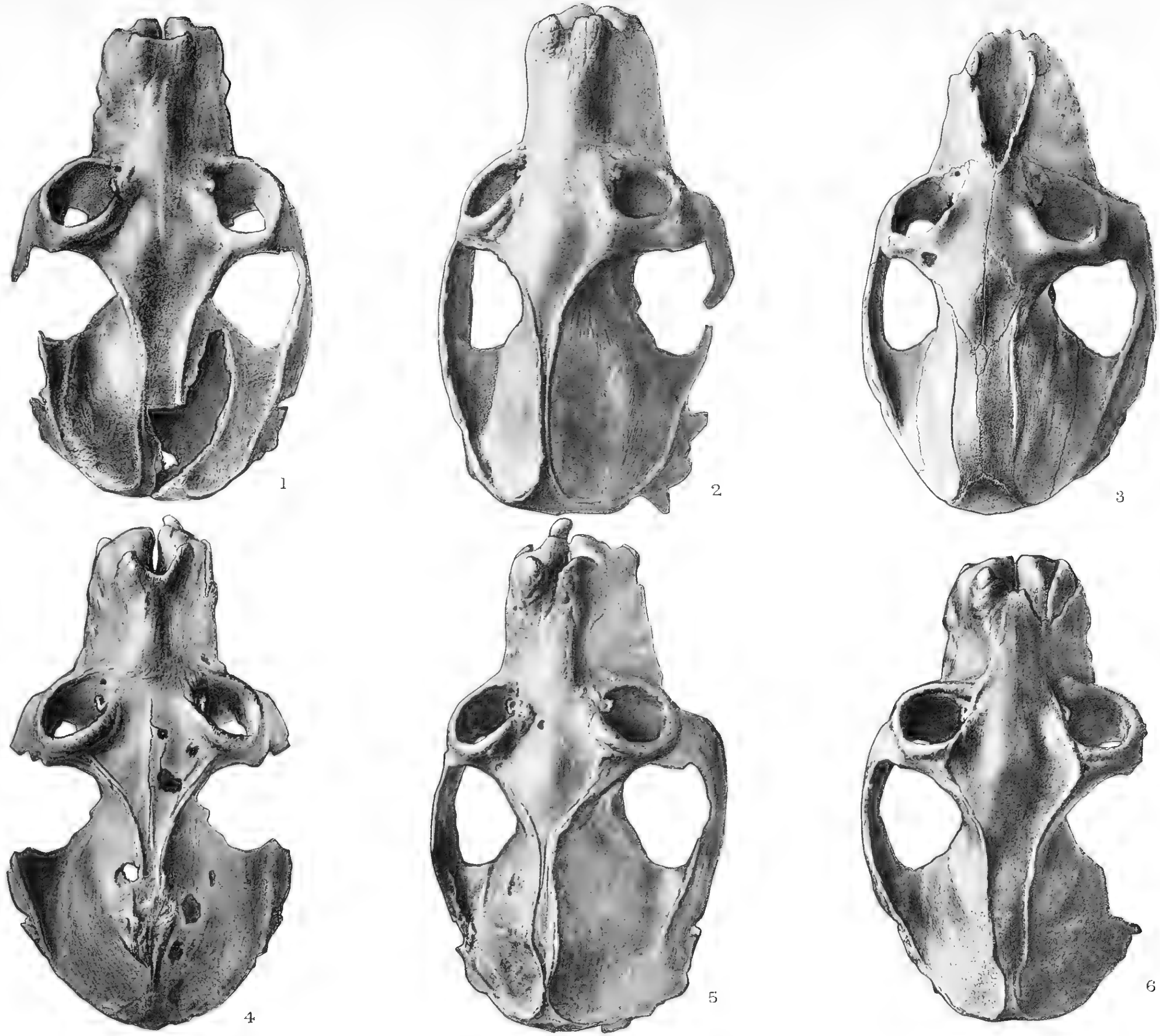
MAXIMUS.

PLATE XIII.

PLATE XIII.

Vertex view of six skulls of *Palæopropithecus maximus.* $\times \frac{1}{2}$.



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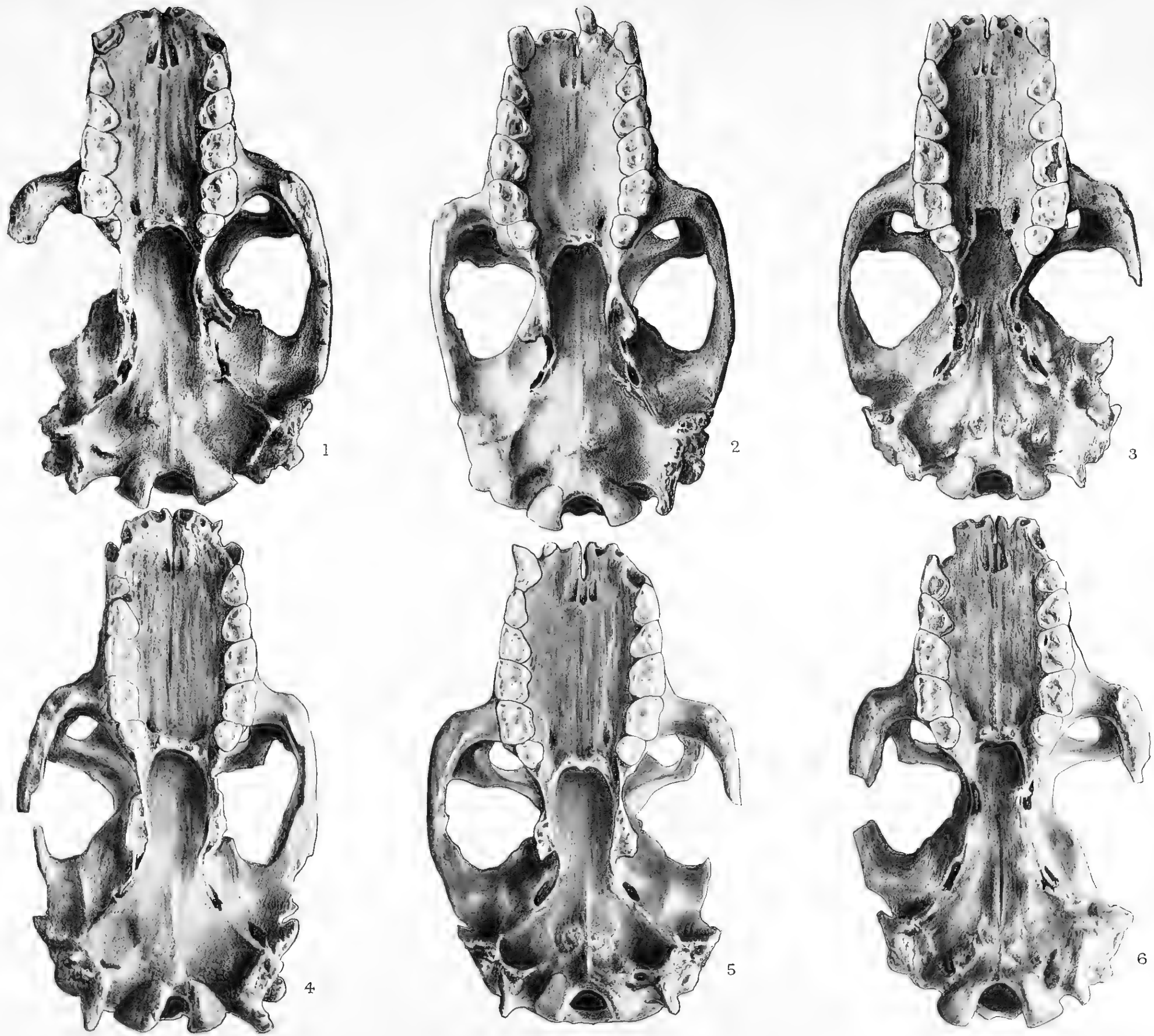
PALAEOPROPITHECUS MAXIMUS.

PLATE XIV.

PLATE XIV.

Basilar view of six skulls of *Palæopropithecus maximus.* $\times \frac{1}{2}$.



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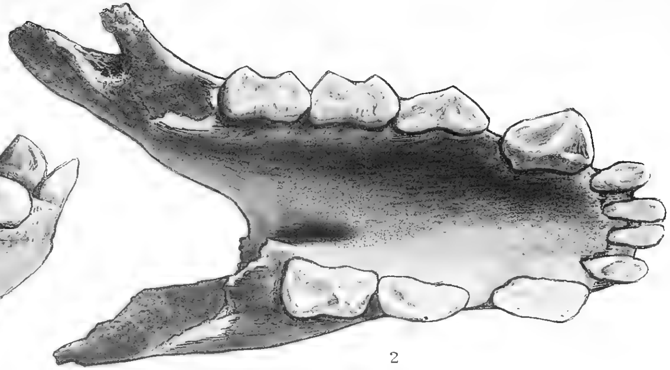
PALAEOPROPITHECUS MAXIMUS.

PLATE XV.

PLATE XV.

Lateral and dorsal views of mandibles and posterior view of skulls of *Palæopropithecus maximus.* Slightly reduced.

1



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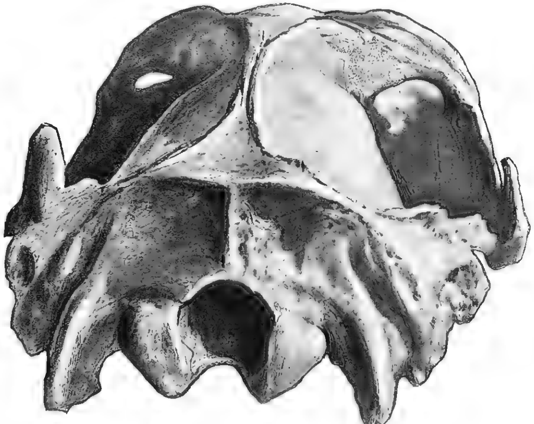

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PALAEOPROPITHECUS MAXIMUS.

PLATE XVI.

PLATE XVI.

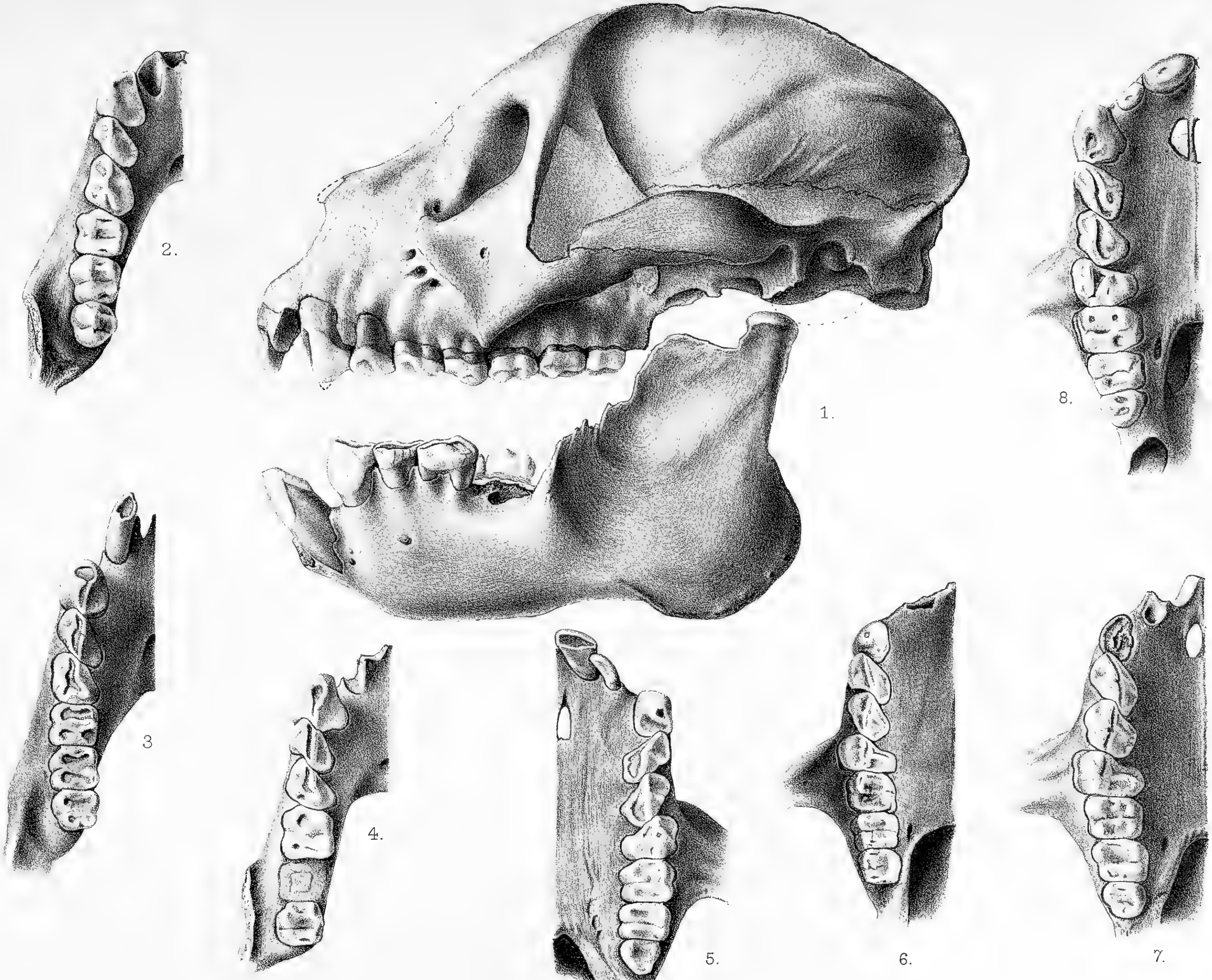
Archæolemur edwardsi (Filhol).

Fig. 1. Profile of skull and mandible.

Figs. 2–4. Views of mandibles showing variations in dentition.

Figs. 5–8. Dentition of upper jaw showing transition from triangular to quadri-tubercular form of 3rd molar; with variations in size and shape of 1st and 2nd molars and premolars.

Natural size.



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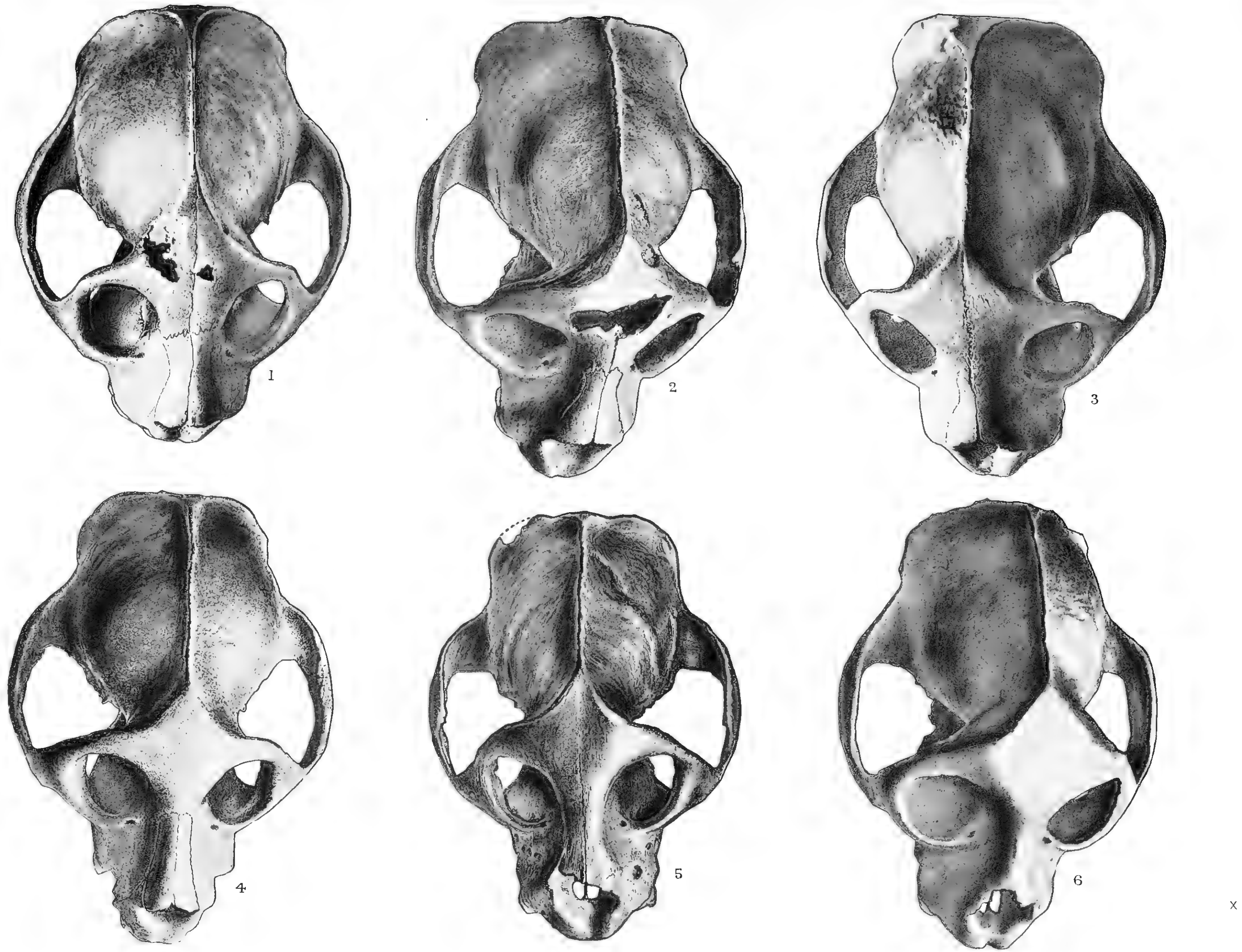
ARCHAEOLEMUR EDWARDSI.

PLATE XVII.

PLATE XVII.

Vertex view of six skulls of *Archæolemur edwardsi.* $\times \frac{4}{7}$.



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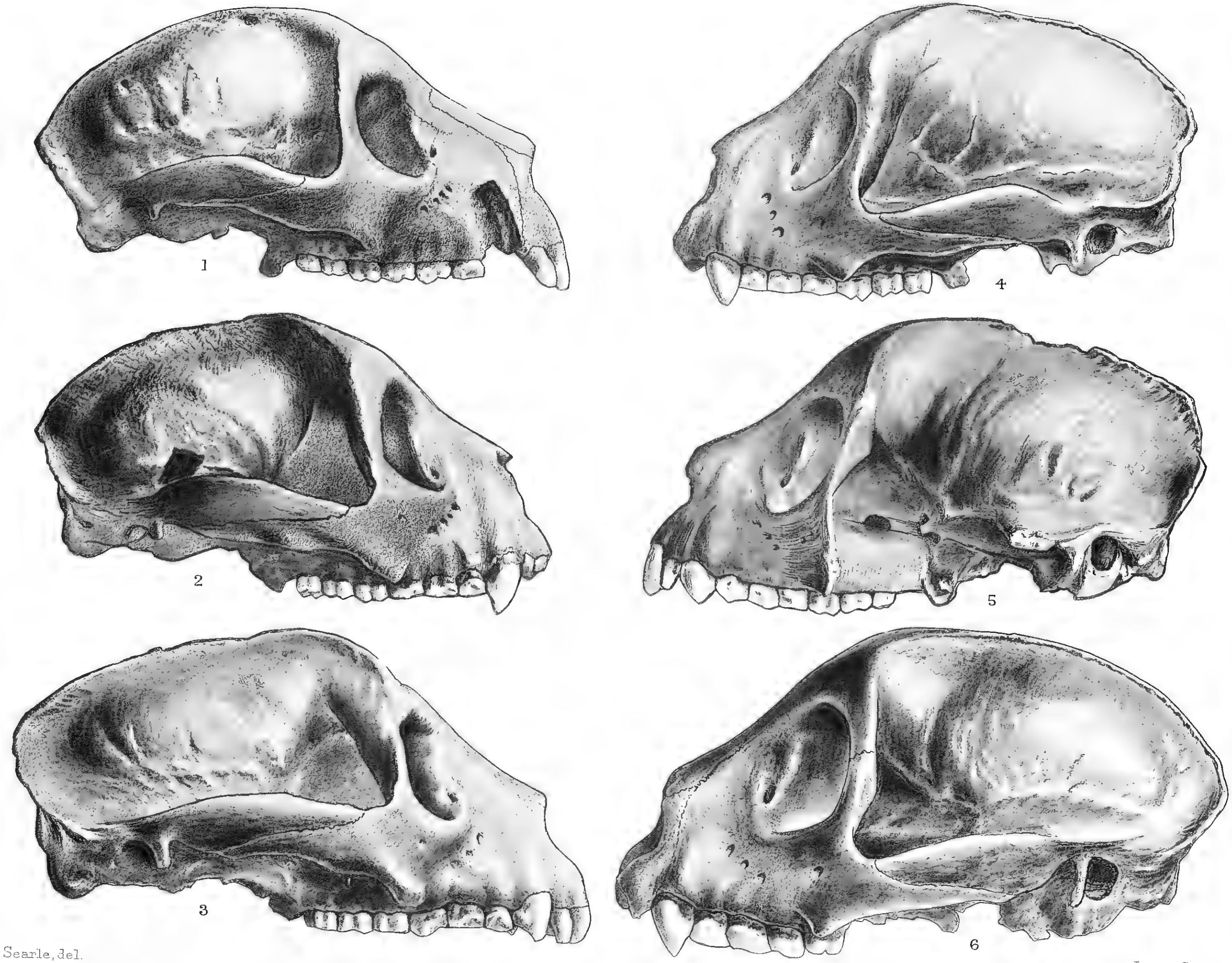
ARCHAEOLEMUR EDWARDSI.

PLATE XVIII.

PLATE XVIII.

Profile view of six skulls of *Archæolemur edwardsi.* $\times \frac{3}{4}$.



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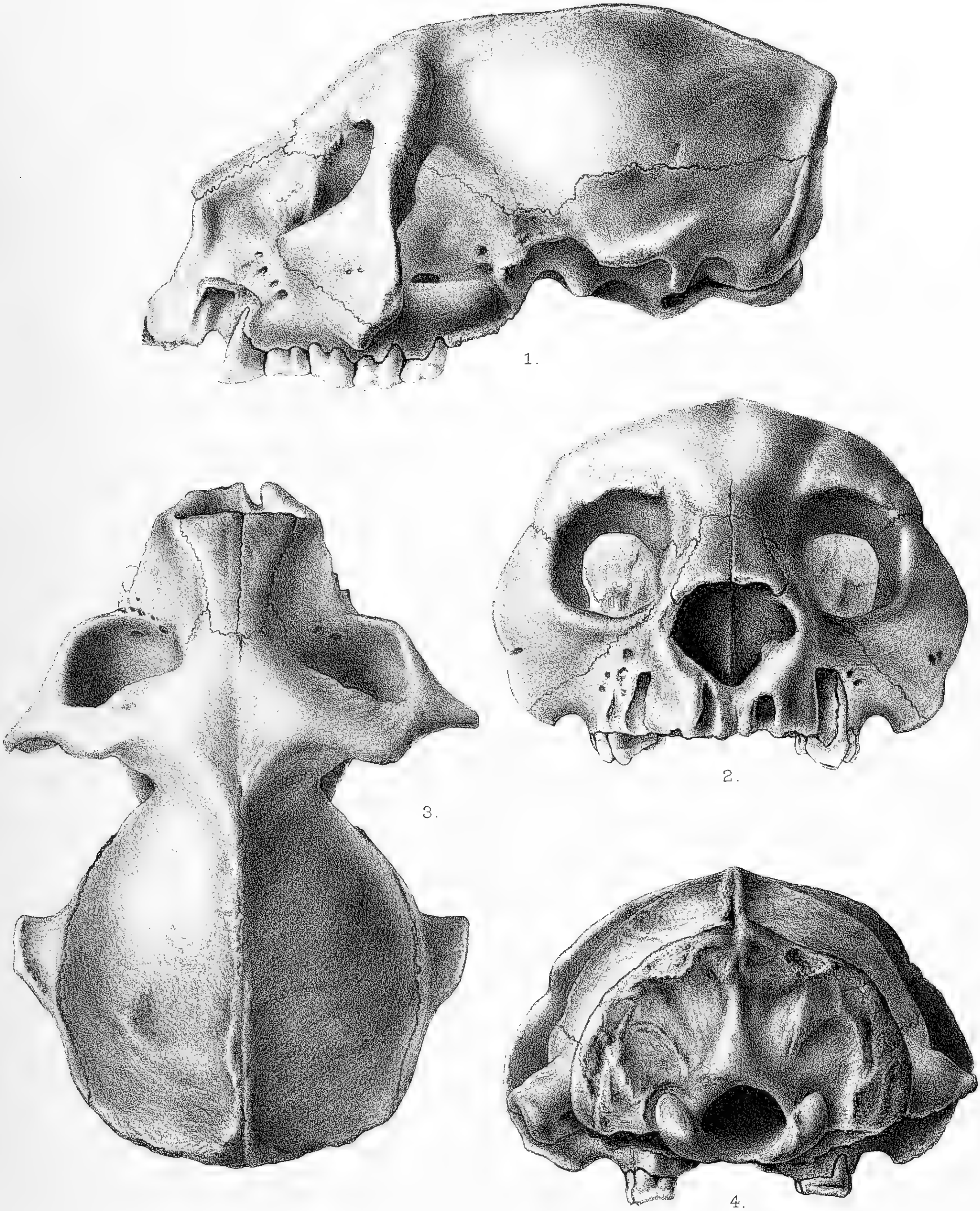
ARCHAEOLEMUR EDWARDSI.

PLATE XIX.

PLATE XIX.

Archæolemur platyrrhinus (Standing).

Fig. 1. View of skull in profile.
Fig. 2. Front view of skull.
Fig. 3. Vertex view of skull.
Fig. 4. View of occiput.



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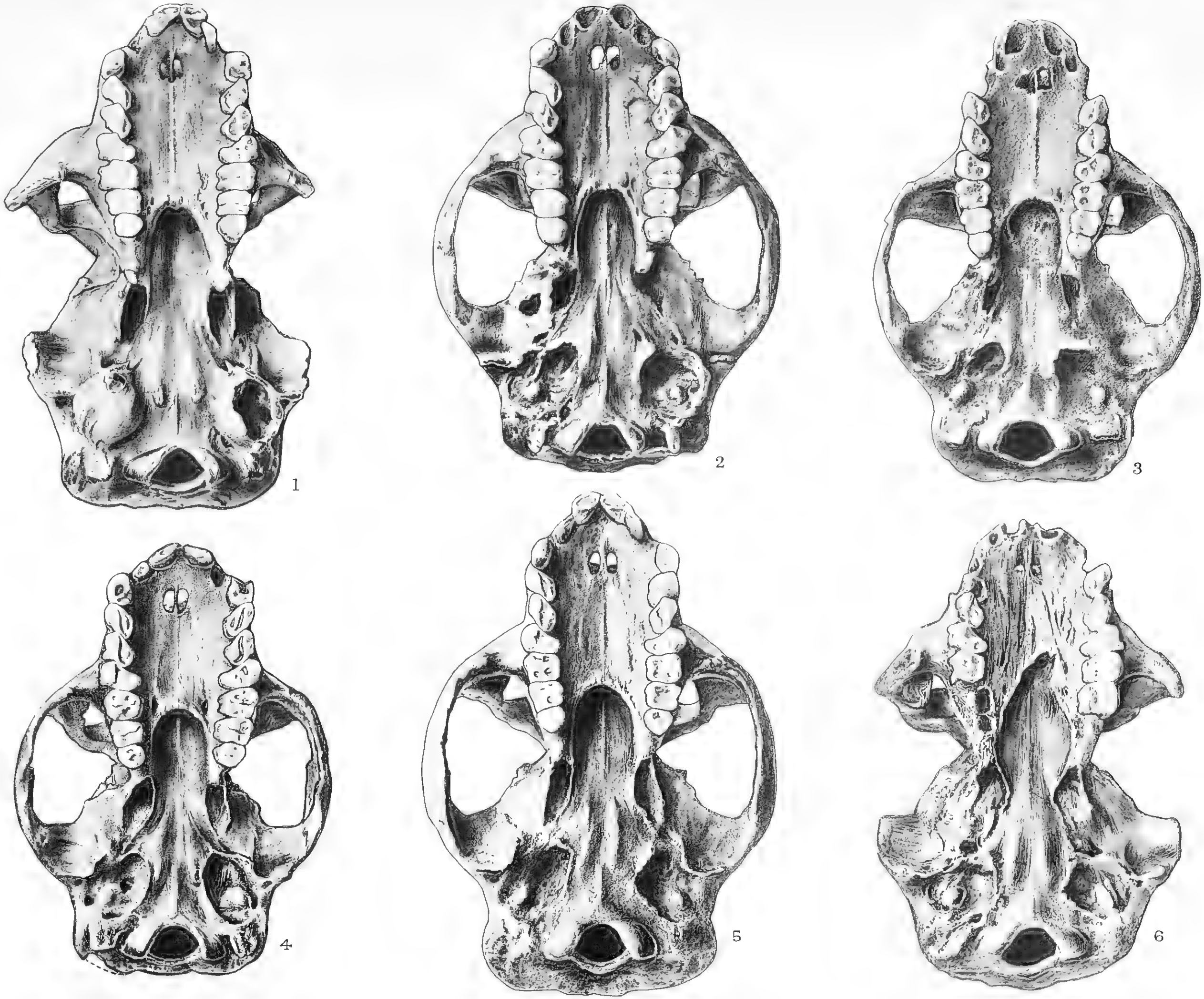
ARCHAEOLEMUR PLATYRRHINUS.

PLATE XX.

PLATE XX.

Basilar view of five skulls of *Archæolemur edwardsi* (Nos. 1–5) and one skull of *Archæolemur platyrrhinus*. $\times \frac{1}{2}$.



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1-5. ARCHAEOLEMUR EDWARDSI. 6. A. PLATYRRHINUS.

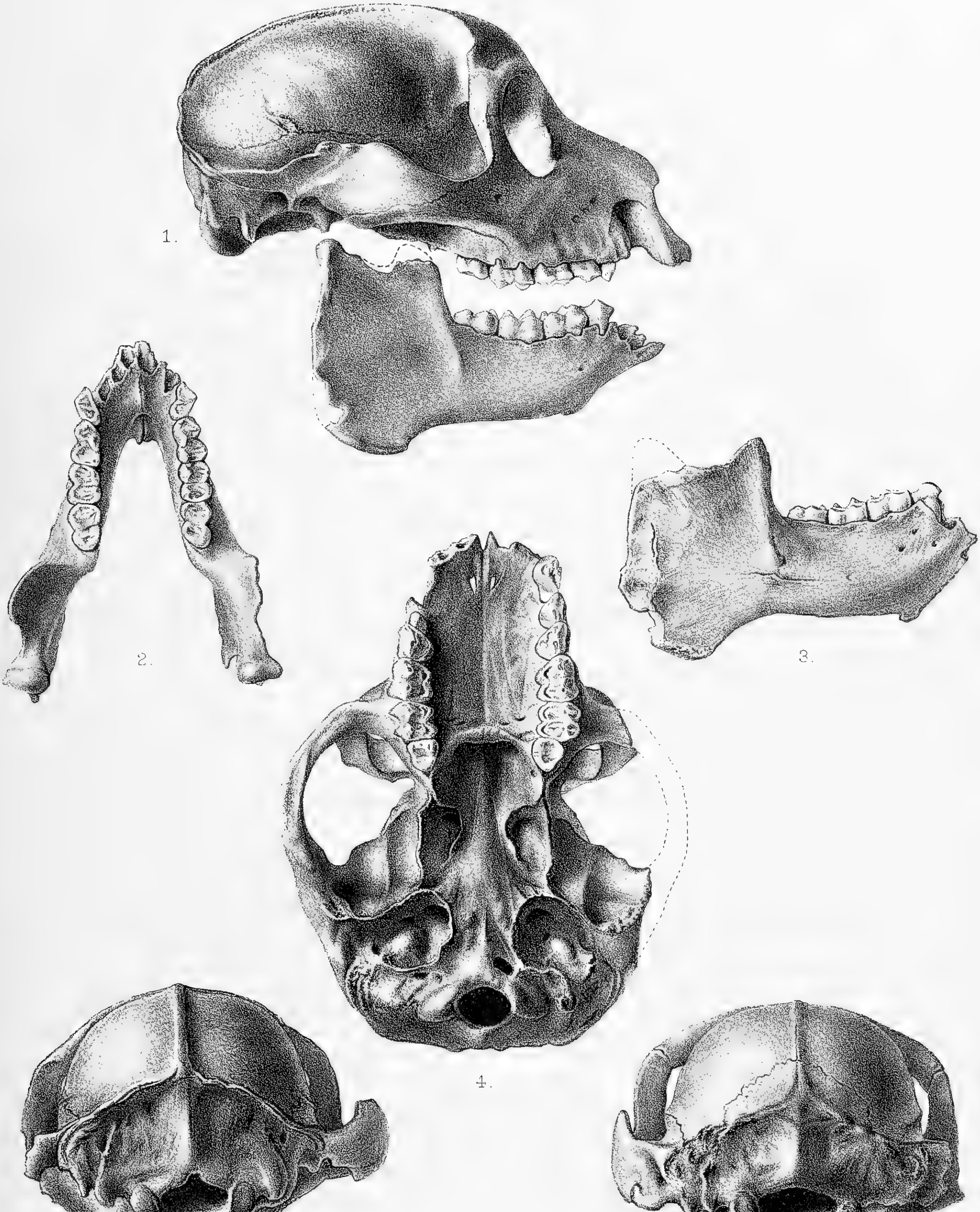
PLATE XXI.

PLATE XXI.

Mesopropithecus pithecoides (Standing).

Fig. 1. View of skull and mandible in profile.
Figs. 2 & 3. Views of mandible.
Fig. 4. Base of skull showing dentition of upper jaw.
Figs. 5 & 6. View of occiputs of two adult skulls.

All natural size.



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West, Newman imp.

MESOPROPITHECUS PITHECOIDES.

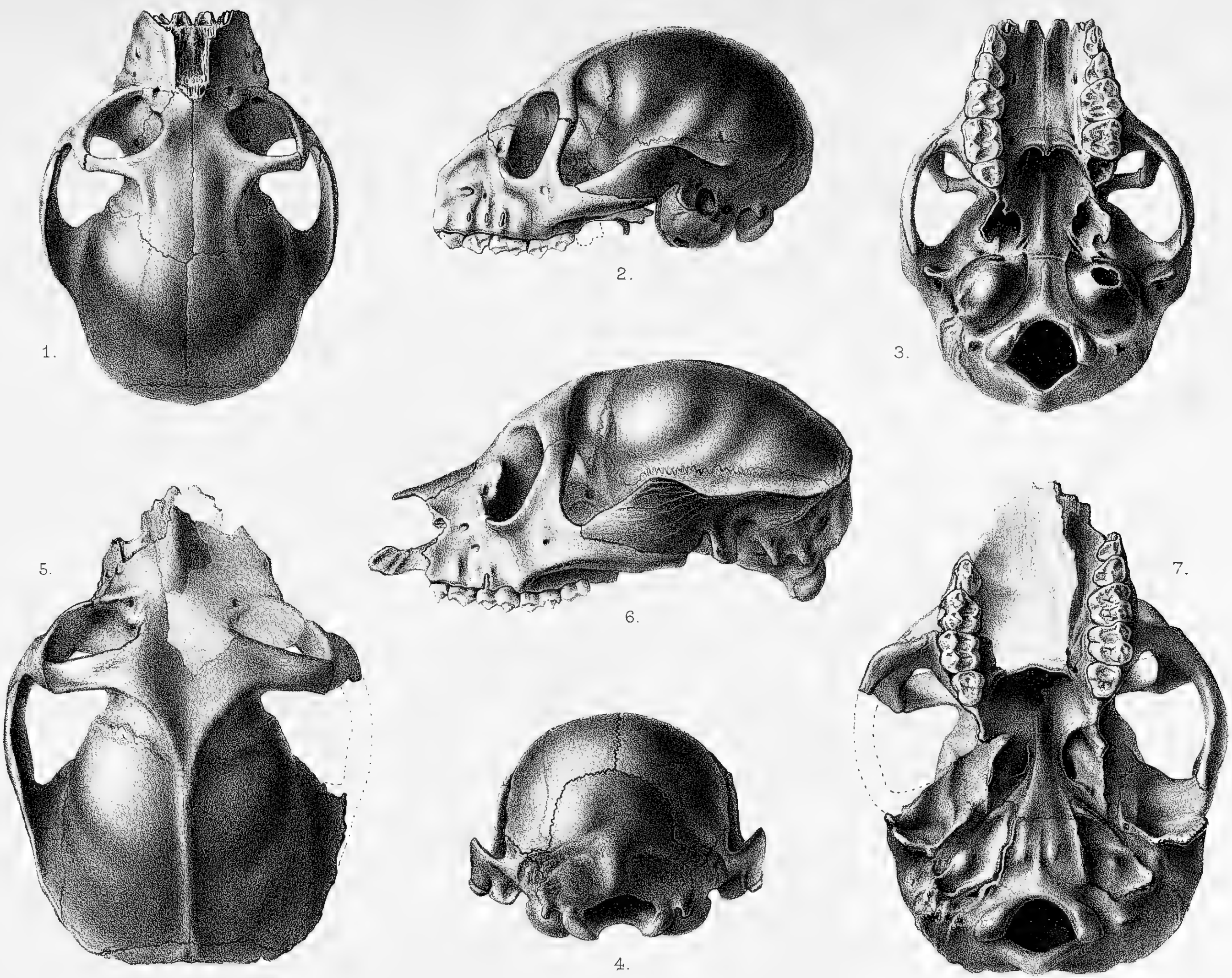
PLATE XXII.

PLATE XXII.

Mesopropithecus pithecoides (Standing).

Fig. 1. Vertex view of young skull showing sutures.
Fig. 2. Profile of young skull.
Fig. 3. Base of young skull (canine just appearing).
Fig. 4. View of occiput of young skull.
Figs. 5–7. View of vertex, profile, and base of adult skull. The occiput of this skull is shown in Plate XXI. Fig. 6.

All natural size.



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MESOPROPITHECUS PITHECOIDES.

PLATE XXIII.

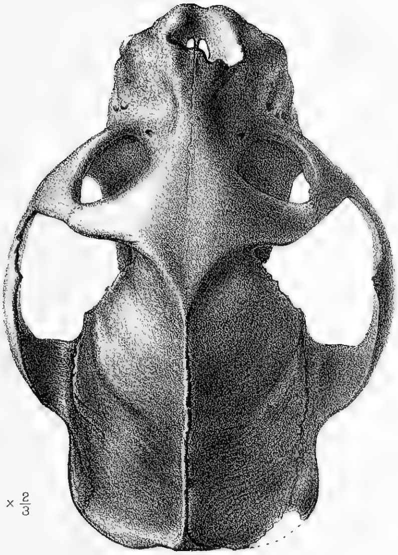
PLATE XXIII.

Skulls of *Archæolemur edwardsi* (Filhol) and *Mesopropithecus pithecoides* (Standing) compared.

Figs. 1–3. View of vertex, profile, and occiput of *Archæolemur edwardsi*. All $\frac{2}{3}$ natural size.

Figs. 4–6. View of vertex, profile, and occiput of *Mesopropithecus pithecoides*. All slightly reduced ($\frac{6}{7}$ of natural size).

Compare also Plates XVII. & XVIII. with Plates XXI. & XXII.



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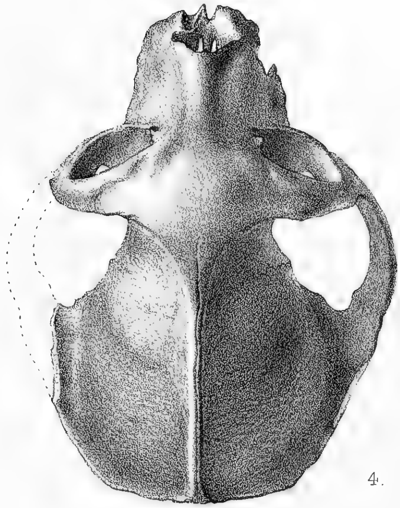
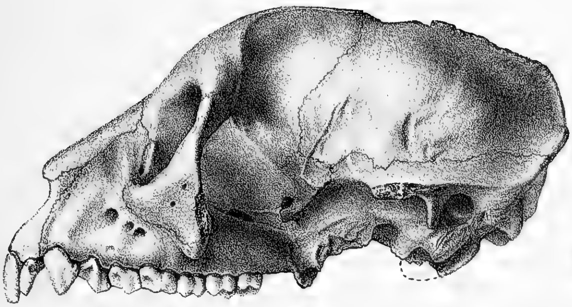
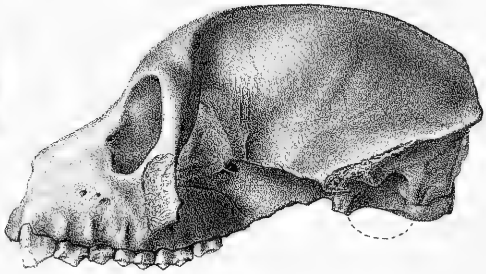


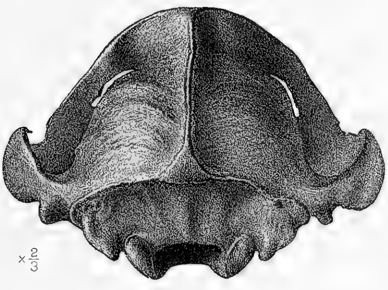
4. $\times\frac{6}{7}$



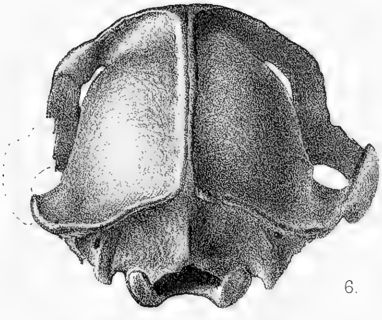
2. $\times\frac{2}{3}$



5. $\times\frac{6}{7}$



3. $\times\frac{2}{3}$



6. $\times\frac{6}{7}$

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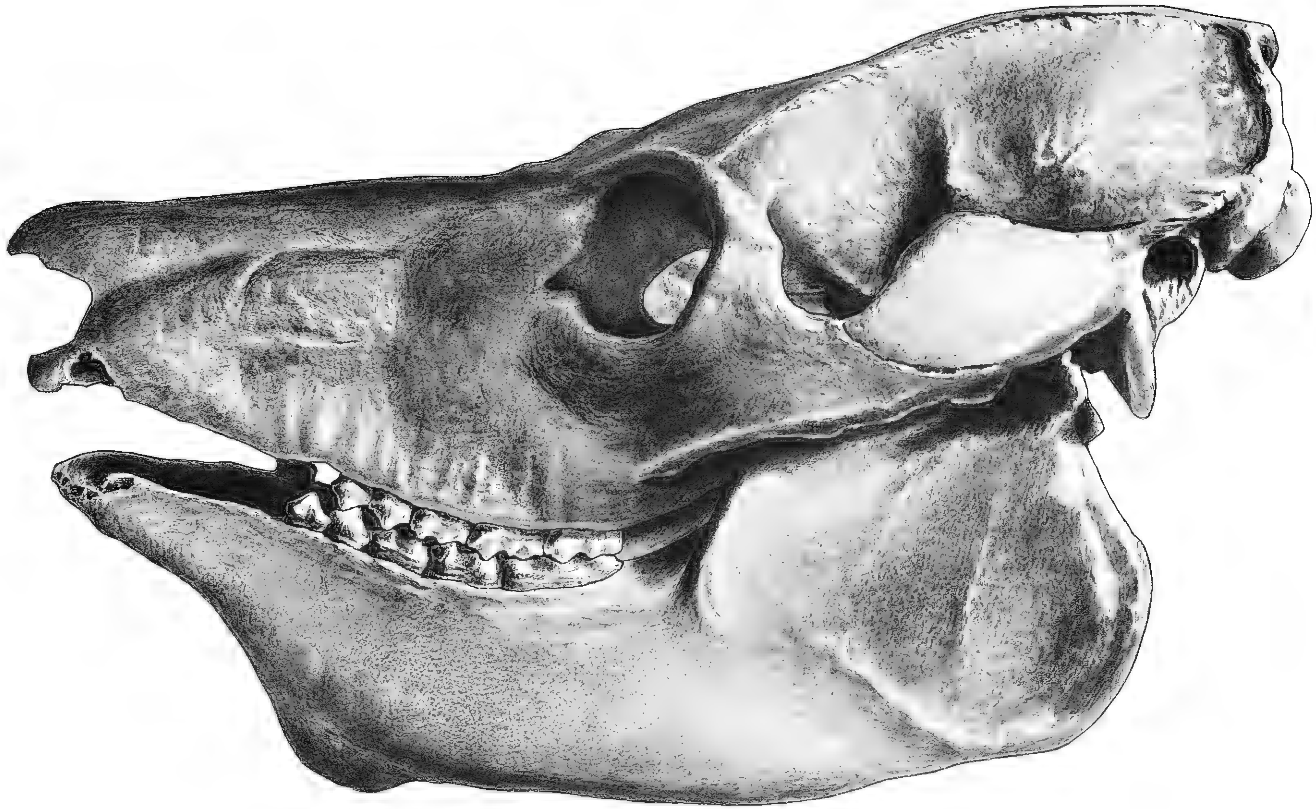
1–3. ARCHAEOLEMUR EDWARDSI.
4–6. MESOPROPITHECUS PITHECOIDES.

PLATE XXIV.

PLATE XXIV.

Profile of skull and mandible of *Megaladapis grandidieri*. $\times \frac{4}{5}$.



× $\frac{4}{5}$

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MEGALADAPIS GRANDIDIERI.

PLATE XXV.

PLATE XXV.

Profile and vertex views of *Megaladapis grandidieri*. $\times \frac{3}{4}$.

1

2

× $\frac{3}{4}$

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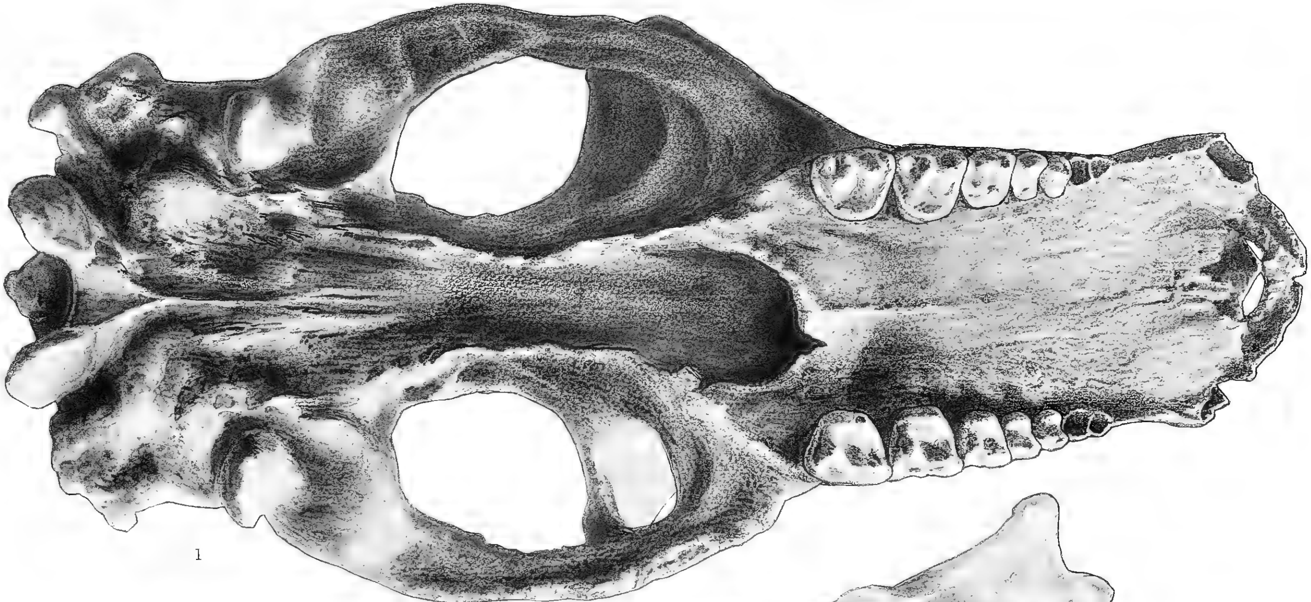
MEGALADAPIS GRANDIDIERI.

PLATE XXVI.

PLATE XXVI.

Basilar view of skull and top view of mandible of *Megaladapis grandidieri*. $\times \frac{4}{5}$.



1

2

× $\frac{4}{5}$

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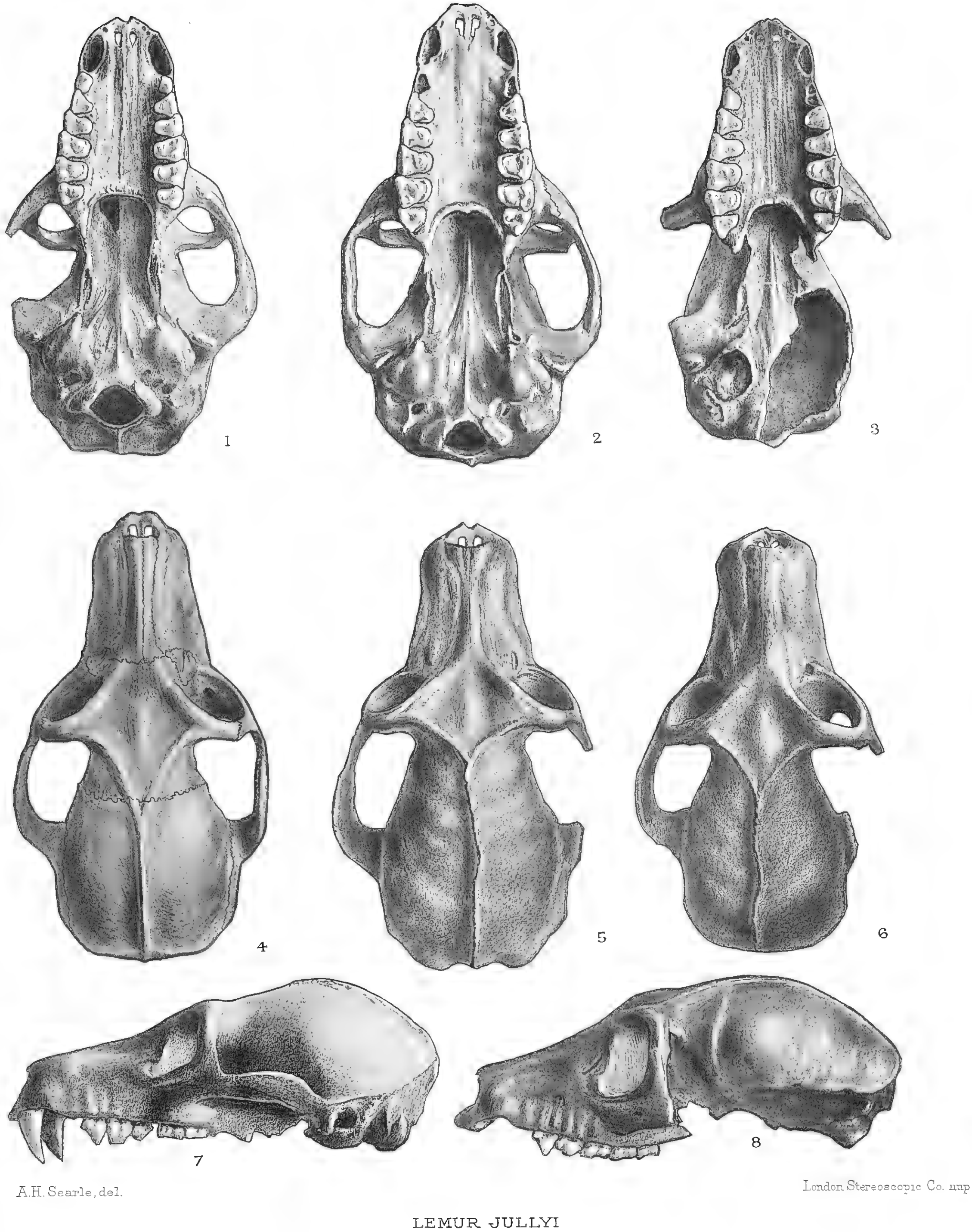
MEGALADAPIS GRANDIDIERI.

PLATE XXVII.

PLATE XXVII.

Three basilar, three vertex, and two profile views of skulls of *Lemur jullyi.*



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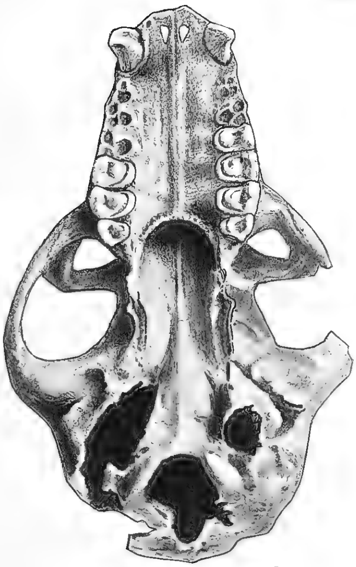
LEMUR JULLYI

PLATE XXVIII.

PLATE XXVIII.

Basilar, vertical, occipital, and facial views of skull of *Lemur majori.*



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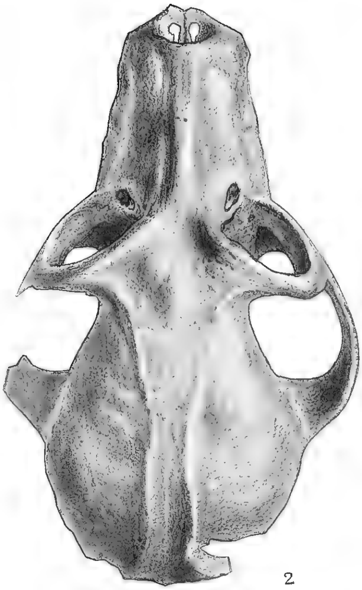

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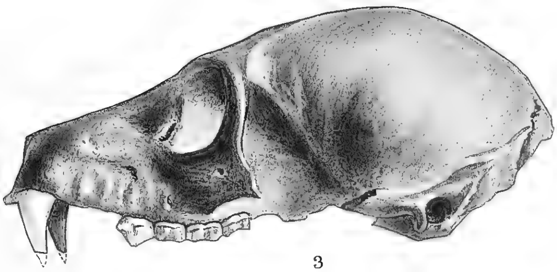

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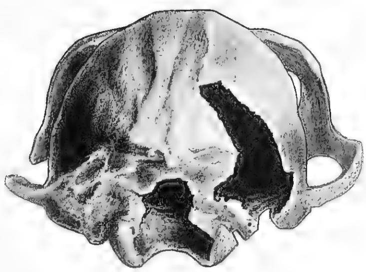

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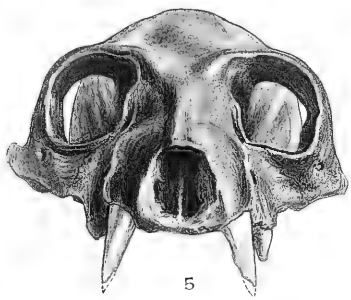

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LEMUR MAJORI.

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May, 1908.

P. CHALMERS MITCHELL,
Secretary.

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Continued on page 3 of Wrapper.

III. *An Account of the South-American* Cheliferinæ *in the Collections of the British and Copenhagen Museums. By* C. J. With.*

Received January 2, 1907; read April 23, 1907.

[Plates XXIX.–XXXI.; Text-figures 64–84.]

At the suggestion of the Director of the British Museum, I have worked out the collections of *Chelonethi* belonging to that institution; this paper deals only with the South-American part; for showing me this confidence I ask Sir E. Ray Lankester to accept my best thanks. I am also obliged to Dr. C. F. Meinert, the Curator of the Arthropods of the Copenhagen Museum, for letting me work out its rich collections of South-American *Cheliferinæ* Sim., partly collected by Dr. Meinert himself in Venezuela. I most heartily thank, too, Mr. Edw. Ellingsen, of Kragerö (Norway), for placing several of his original specimens of South-American species at my disposal, as well as Mr. A. S. Hirst, who was kind enough to assist me with the literature in several ways.

Copenhagen, November 1906.

GENERAL REMARKS.

The author who has done more than any other to advance the study of the *Cheliferinæ* from South America is L. Balzan. His researches have converted this region from practically "terra nuda" to one of the best-explored continents with respect to the group in question. Later E. Ellingsen published a number of papers describing imperfectly known and new species. He has also done much to increase our knowledge of the geographical distribution of these animals, and by practical analytical keys has made the study and determination of the species a fairly easy task. As the collection at my disposal was very rich (at least 300 specimens, comprising 36 species, of which 13 were new—about 45 species having been previously described), and included a large percentage of the known species, as well as several new ones, and as I found that important groups of organs were scarcely mentioned in the somewhat imperfect descriptions given in Balzan's earlier papers, I thought it would be very useful to work out a kind of monograph. The richness of the material also made it possible for me to define more sharply than in a recently published paper the limits of the systematic groups, most of which in future will probably be recognised as natural genera †.

* Communicated by Dr. W. T. Calman, F.Z.S.

† To two papers of Alb. Tullgren (23–24), in which he deals with South-American *Chelonethi*, I have not been able to pay due attention because they were published during the printing of this paper.

Some of the species established may possibly be identical with forms described by Banks from North America; but if this proves to be the case I may be excused by the fact that the descriptions of that author, at least so far as the False-Scorpions are concerned, are generally too imperfect for even approximate identification.

The South-American and perhaps all *Cheliferinæ* are divided into at least four groups; the reasons why I have not given these groups the rank of genera are, that one of them may be subdivided, that some interesting species were not at my disposal, and that a comparative investigation of the male organs ought to be undertaken before definitely settling the case.

Key to the Groups of Cheliferinæ (*Simon*).

a. Fingers of the palps without accessory teeth. Galea better developed in females than in males.

a[1]. Femora of the first pair of legs with slightly developed articulation between the two portions, with the posterior condylus placed higher than the anterior; flagellum consisting of four hairs; ♂ with sternal spines; distinct transverse grooves; obtuse or clavate hairs; generally real eyes; "tactile" hair of tarsus IV. well removed from base; claws and subterminal hair simple . . II. Group of *Chelifer subruber* Sim.

b[1]. Femora of the first pair of legs with well-developed articulation and with posterior condylus placed lower than anterior; ♂ never with sternal spines.

a[2]. Real eyes; obtuse or clavate hairs; "tactile" hair of tarsus IV. far removed from the base; distinct transverse grooves; genital area of ♂ with long ram's-horn-shaped organs; coxæ IV. (♂) with coxal sac, and its tergites often with lateral keels; claws and subterminal hair generally with teeth . . . . I. Group of *Ch. cancroides* L.

b[2]. No real eyes; pointed almost simple hairs; "tactile" hair of tarsus IV. basal; transverse grooves generally indistinct or wanting; genital area of ♂ without ram's-horn-shaped organs; coxæ IV. without coxal sac and tergites without lateral keels; claws as well as subterminal hair always simple.

IV. Group of *Ch. birmanicus* Thor.

b. Fingers of the palps with accessory teeth. Femora of the first pair of legs with well-developed articulation between the two portions and with posterior condylus placed lower than anterior.

III. Group of *Ch. cimicoides* F.

a[3]. "Tactile" hair of tarsus IV. more than $\frac{1}{4}$ removed from base; tibia IV. without dorsal median "tactile" hair; tibia of the palps without posterior "tactile" hairs in middle; galea larger in ♀ than in ♂.

a[4]. Four hairs in flagellum; real eyes; abdominal tergites with 30 short clavate hairs along hindmost margin and 8 in front.

III *a*. Subgroup of *Ch. rudis* Balz.

b^4. Three hairs in flagellum; generally ocular spots; abdominal tergites with not more than 6 hairs in front of the marginal row.

a^5. Hand at least 1·1 as long as the tibia; transverse grooves generally wanting; obtuse or pointed hairs. III *b*. Subgroup of *Ch. subrobustus* Balz.

b^5. Hand less than 1·1 as long as the tibia; transverse grooves always present . . . . III *c*. Subgroup of *Ch. bicolor* Balz.

b^3. "Tactile" hair of tarsus IV. $\frac{1}{5}$ removed from base; tibia IV. with dorsal median "tactile" hair; tibia of the palps with two posterior "tactile" hairs; no sexual difference in galea; hairs pointed and almost simple . . . . III *d*. Subgroup of *Ch. argentinus* Thor.

In the following are set forth a few remarks about the specific characters. The structure of the *eyes* is, of course, of some importance, but undue value should not be given to this character, as variations are sometimes found within the same species, at least between males and females. The shape of the *cephalothorax*, or more correctly the cephalothoracic shield (for instance, its length compared with its breadth), the structure of the transverse grooves, of the granulations and hairs are, of course, of some importance. The development of the *galea* is of no small value within certain groups, but its sexual and often important individual variations must necessarily be taken into account; the *flagellum* is of more generic than of specific value. The shape of the *serrula* and *lamina interior* shows specific differences, but as the individual variations are often well pronounced, and as they are rather difficult to examine, I think that they are generally not worth describing.

In the description of the *palps* not only is the shape of the joints important, but also the proportions between their length and breadth. The relative proportions of the different joints are of the greatest importance. As far as the hand is concerned it is necessary sharply to distinguish between the breadth and the depth, to give their proportions to each other, and to compare them with the length of hand and finger. Not only should the structure of the usual *hairs* be mentioned, but also the arrangement of the longer and more slender "tactile" hairs. Valuable characters are often found in the position of the tactile hairs as well as in the number and arrangement of *accessory teeth* and "*spots*" or "sense-spots," in spite of often considerable variation within the same species.

The *coxæ*, especially those of the fourth pair, often provide characters of great interest and should always be examined, the sexual difference, of course, being taken into consideration. In most previous descriptions the *legs* are scarcely mentioned, and the workers on the systematics of this group have not at all realised the importance of these appendages, not only in the definition of groups of species (*cf.* the structure of the first pair of femora, of the claws and subterminal hair, and the position of the "tactile" hair of tarsus IV.), but also in distinguishing nearly related species (*cf.* for instance *Ch. javanus* Thor. and *Ch. plebejus* With). As a whole, the value of these organs can scarcely be too strongly emphasised, not only when our purpose is the mere determination of a species, but also when we wish to understand its real systematic position; of course, it is not of much value to examine the legs *in situ*: the first and the fourth pair on the right or left side should be dissected off and measured exactly.

The colour of the palps and dorsal surface of the body is sometimes of value, that of the rest of the body is non-important in the description of species.

Finally, it should be emphasised that it is of the greatest interest to determine the sex of the specimen to be examined. So far as the terminology, measurements, &c. are concerned, I refer to my earlier publication (*cf.* 20. pp. 56–58).

I. Group of Chelifer cancroides L.

Femur of the first pair of legs with wide oblique articular cavity. Chela of the palps without accessory teeth. Real eyes. "Tactile" hair of tarsus IV. well removed from base. ♂ with genital plates of peculiar structure, with long ram's-horn-shaped organs, with coxal sac, and with posterior margin of the coxa concave.
(*The claws are generally provided with teeth and the subterminal hair is often of peculiar shape. Two distinct transverse grooves, of which the posterior is sometimes the broader. Hairs obtuse or clavate. ♂ generally with tergal lateral keels.*)

For the characteristics of this group I refer to my earlier paper (*cf.* 20. p. 132) and to the above diagnosis; I shall only add that the *subterminal* * hair is sometimes completely simple (*cf.* the descriptions). The *flagellum* consists of three hairs, and a sexual difference is found in the galea. Twenty species at least of the great number of Chelifers described as having real eyes may with more or less certainty be referred to this group.

From Asia: *Ch. bicarinatus* Sim.; *Ch. bifissus* Sim. (?); *Ch. bisulcus* Thor. (?); *Ch. borneonensis* Ell.; *Ch. depressus* C. K.; *Ch. hians* Thor.; *Ch. mortensenii* With; *Ch. superbus* With; and *Ch. amurensis* Tullgr.

From Africa: *Ch. sculpturatus* Lew.; *Ch. socotrensis* With; *Ch. mucronatus* Tullgr.; and *Ch. torulosus* Tullgr.

From Europe: *Ch. cancroides* L.; *Ch. disjunctus* L. K.; *Ch. hermanni* Leach; *Ch. lampropsalis* L. K.; *Ch. maculatus* L. K.; and *Ch. meridianus* L. K.

From North America: *Ch. biseriatus* Bk. and *Ch. scabiculus* Sim.

* I hope that it will meet with general approbation to designate "the terminal lateral hair" subterminal in the future.

From South America: *Ch. imperator*, sp. n.; *Ch. rex*, sp. n., and *Ch. macropalpus* Tullgr.

From Australasia (Hawaii): *Ch. bifissus* Sim.

As species of this group have never previously been described from South America (the domestic species *Ch. cancroides*, of course, excepted), the occurrence of two curiously developed species is of peculiar interest.

Synopsis of Species *.

a. Claws of fourth pair of legs with teeth. Tergites of ♂ with lateral keels, and the distinctly gaping fingers of the palps without any process on the inner margin of the movable finger.

- a^1. The hand as long as the finger. The tarsus of the first pair of legs in ♂ dorsally without terminal projection . . . . 1. *Ch. cancroides* L.
- b^1. The hand at least 1·4 as long as the finger. Femur 8·5 (♂) or 5·8 (♀) as long as wide. The tarsus of the first pair of legs in ♂ dorsally with terminal projection . . . . 2. *Ch. imperator*, sp. n.

b. Claws of fourth pair of legs without teeth. Tergites of ♂ without lateral keels, and the slightly gaping fingers of the palps with a distinct process on inner margin of movable finger. The femur is 4·7 as long as wide. The tarsus of the first pair of legs in ♂ without any terminal projection dorsally . . . . 3. *Ch. rex*, sp. n.

1. Chelifer cancroides L.

From South America this widely distributed species has been recorded from Cape Horn (Simon, 6. p. 36), from Tierra del Fuego (Simon, 12. p. 167), and from Pará (Ellingsen, 18. p. 16).

2. Chelifer imperator, sp. n. (Plate XXIX. figs. 1 *a–i*.)

Male.

Cephalothorax.—One pair of distinctly convex *eyes*. Cephalothorax distinctly longer than wide behind. Two prominent very deep transverse *grooves*, which are almost straight, are present. Cephalothorax uniformly and distinctly granular, but also provided on each side with about 12 small tubercles, which each bear a single short clavate hair.

Abdomen (Plate XXIX. figs. 1 *a–b*).—The abdomen is fairly elongated and depressed, in connection with the cephalothorax showing an elongated egg-shaped circumference. All tergites except the first two with distinct *longitudinal line*. From the first to the eighth the abdominal tergites possess, like the second thoracic, *lateral keels*, which are

* *Chelifer macropalpus* Tullgr. (23. pp. 26–29, fig. 1) from Haiti is nearly related to *Ch. imperator*, sp. n., but scarcely identical with it on account of smaller size, less slender tibia of the palps, and different structure of claws (posterior claw of first pair of legs possesses a tooth).

blunt anteriorly, but backwards and upwards produced into a fairly acute stylet; the whole structure appears, in the median segments at least, similar to a hatchet; the keel of the ninth segment is only slightly developed and that of the tenth just indicated (fig. 1 *a*). Skin everywhere distinctly *granular*. Tergites bear in a row along the hindmost margin from 12–14 clavate hairs in addition to a single lateral hair in front of the row, which together with the outermost of the row is placed on the lateral keel; the second to the tenth tergites bear also a median hair in front of the row on each side, as well as a single hair between the two mentioned, with the exception of the second and third segments. The eleventh tergite bears in addition to eight hairs, placed in two rows, about 100 small round spots, perhaps seats for minute fissures, and so does the corresponding sternite.

Antennæ.—The terminal hair extends distinctly beyond the slender cylindrical *galea*, which possesses two almost obsolete teeth just beyond the middle and three more developed terminally.

Palps (Pl. XXIX. figs. 1 *c–d*).—The *maxillæ* are granular all over. Trochanter and femur of palps are distinctly granular, the latter joint less distinctly so ventrally; the two following segments only slightly granular, except in front laterally; in addition to the usual granulations the trochanter bears posteriorly some more rounded small tubercles as well as about five larger conical eminences; on the anterior surface of the femur about 25 triangularly shaped tubercles are observed, while the tibia shows traces only of similar structures. *Hairs* are short; those of trochanter as well as of anterior surface of femur and in a less degree of tibia are slightly clavate, while others are more or less obtuse except pointed ones of fingers; the tubercles just mentioned always possess a single hair. The *trochanter*, which has a long and very well-defined stalk, is 2·3 as long as wide; it is wider than femur or tibia and twice as long as chela is wide; the anterior outline beyond the stalk is slightly convex and then almost straight, while the posterior is produced just beyond the stalk and then distally becomes a little concave. The *femur*, which has a short, well-pronounced stalk, beyond which it is gradually, but most distinctly, widened out towards the extremity, is 8·5 as long as wide; anteriorly, beyond the stalk and a short basal elevation, marked off from each other by a low notch, it is slightly concave, while posteriorly beyond the stalk it is slightly convex, and then straight, or even a trifle concave. The *tibia*, which is distinctly shorter and a little wider than the femur, has a short fairly well-defined stalk and is gradually and distinctly widened out towards the tip; it is almost eight times as long as wide terminally; the outline beyond the rather shallow notch of stalk is almost straight and then a trifle concave anteriorly, but posteriorly beyond the small condylus and the elongated badly defined basal elevation it is moderately concave and then convex but for a slight concavity terminally. The *chela* is seven times as long as wide; the *hand*, which is much shorter than the tibia and 1·4 as wide, is 4·2 as long as wide, as wide as deep, and 1·5 as long as the finger. The *fingers* gape very distinctly when closed, as both those movable and, in a less degree, those immovable are concave in the middle and bear on the distal fifth, where they touch each other, a close row of conical teeth. In addition to this the movable fingers possess about five marginal teeth in the middle, and the immovable six teeth in the middle and five more basally. The immovable fingers bear anteriorly about seven "*spots*," arranged as shown in figure 1 *d*, and the movable fingers about 15 arranged longitudinally from base to tip; both fingers appear to have numerous spots on the posterior surface, but details could not be investigated in the single specimen at my disposal.

Coxæ (Pl. XXIX. fig. 1 *b*).—The second and third pair of somewhat irregular shape, widened out towards the extremity and rather elongated—especially the third pair, which in shape somewhat resemble the fourth pair, which are almost 2·5 as long as wide, very short basally and distinctly widened out towards the end, where they bear a prominent exterior spine. The posterior margins of the fourth pair are distinctly concave in the middle.

Coxal sac.—The coxal sac is very small and is far from filling the whole coxa; in structure it is very similar to that of *Ch. mortensenii* With, as it has a well-developed basal portion, scarcely half as long as the distal; posteriorly the two portions pass into each other, but are separated anteriorly by a deep cleft, continued above and below into a shallow depression. As regards the structure of the funnel, which has some of the fused hairs prolonged into the cavity of the distal sac (*cf.* 21. pl. vii. fig. 4 *f*), I refer to *Ch. mortensenii* With (20. pp. 46–47). The distal portion of the sac tapers somewhat towards the end, where it bears numerous setigerous cones and ridges, which, towards the base, are most marked on the anterior surface.

Legs (Pl. XXIX. figs. 1 *e–f*).—Hairs short, especially dorsal ones, obtuse or slightly clavate. *Subterminal* hairs of the first pair bear no teeth; the anterior is shorter and more suddenly curved (fig. 1 *f*, *hi*) in contrast to the posterior, which is more slender and only slightly curved (*he*); the posterior subterminal hair of the fourth pair is slender and moderately curved, with a tiny ventral tooth near the tip. A tarsal "*tactile*" hair, $\frac{3}{4}$ removed from the tip, seems to be present. The legs are rather long and slender; the trochanter of the first pair is much deeper than the femur proper, probably in correspondence with the very wide articular cavity; the tibia is much (1·3) longer than the *tarsus*, which is about four times as long as deep in the middle, where it is deepest on account of the slightly convex ventral margin; this joint is terminally, behind and above the articulation of the claws, produced into a small conical eminence (*p*). The *femur* of the fourth pair of legs, which is very suddenly raised beyond the stalk, is 2·8 as deep as long, 1·3 as long as tibia, and 1·4 lower than tarsus long. The anterior *claw* of the first leg (fig. 1 *f*, *ci*) is abruptly curved, with a median, almost obsolete, ventral tooth, in contradistinction to the posterior claw (*cex*), which is only moderately curved, without any tooth; the claws of the second pair of legs appear bifurcate, while those of the third and fourth pair possess a rather small anterior tooth.

Colour.—The palps are reddish brown; the body is darker brown, with almost black lateral keels.

Measurements.—Cephalothorax 1·10 (0·920); abdomen 2·19 (1·38) mm.

Palps: trochanter 0·736 (0·322); femur 2·162 (0·253); tibia 2·070 (0·263); hand 1·541 (0·368), depth 0·370; finger 1·035 mm.

Leg I.: femur 0·70 (0·190), trochantin 0·130 (0·213); tibia 0·486 (0·129); tarsus 0·380 (0·099) mm.

Leg IV.: femur 0·930 (0·334); tibia 0·699 (0·167); tarsus 0·471 (0·106) mm.

Female.

Cephalothorax.—The transverse grooves, especially the posterior, are less distinctly marked.

Abdomen.—The abdomen is less depressed; the second to the tenth tergites with distinct longitudinal line and the first and last tergites with trace of one. Tergal longitudinal keels are wanting. Number of hairs is somewhat greater; in the hindmost marginal row, for instance, 14–16 are found.

Antennæ.—The terminal hair extends scarcely beyond the galea, which terminally bear about four short teeth.

Palps (Pl. XXIX. figs. 1 *g–h*).—The *maxillæ* are only distinctly granular laterally. The *trochanter*, which has a rather short, but well-defined stalk, is only 1·7 as long as wide, and 1·3 as long as chela is wide; anterior outline is slightly convex, while the posterior, beyond the stalk, is rather suddenly produced into a conical tubercle somewhat dorsally placed. The *femur* is only 5·8 as long as wide and is less widened out towards the extremity. The *tibia* is almost as in the male, but only 4·3 as long as wide. The *chela* is 4·4 as long as wide; the *hand* is only 2 6 as long as wide, but 1·4 longer than the finger; the fingers (fig. 1 *h*) gape slightly when closed and are provided with marginal teeth from base to tip. The number of "*spots*" is almost the same as in the male, but they are somewhat smaller anteriorly; the immovable finger has posteriorly about five "spots," arranged between two basal and the median tactile hairs, and the movable has about ten "spots" arranged in a longitudinal area between and beneath the tactile hairs (*cf.* fig. 1 *h*).

Coxæ (Pl. XXIX. fig. 1 *i*).—As regards the difference from the male, I refer to fig. 1 *i*.

Legs.—The *claws* of the first pair of legs possess large anterior teeth. The *tibia* of the first pair of legs is only 1·2 as long as the tarsus, which gradually tapers towards the end, where no dorsal conical process is found, and attains a length 4·5 times its depth. The *femur* of the fourth pair is three times as long as deep and 1·6 lower than tarsus is long.

Colour.—The palps and, more markedly, the body somewhat lighter.

Measurements.—Cephalothorax 1·06 (0·88); abdomen 1·84 (1·27) mm.

Palps: trochanter 0·552 (0·322); femur 1·472 (0·253); tibia 1·288 (0·299); hand 1·127 (0·437), depth 0·437; finger 0·805 mm.

Leg I.: femur 0·638 (0·190), trochantin 0·122 (0·198); tibia 0·456 (0·122); tarsus 0·395 (0·089) mm.

Leg IV.: femur 0·836 (0·296); tibia 0·646 (0·160); tarsus 0·456 (0·122) mm.

Material.—Of this very interesting species from Brazil I have examined two specimens, a male and a female.

Remarks.—It is not without hesitation that I have referred the two specimens (♂ ♀) to the same species, as the differences in their whole appearance are so striking, and as the finger of the female is somewhat longer than in the male, while the contrary is generally the rule; but as they were found together, and as great similarity is found in the structures which are not subject to sexual variation, I think that the course I have taken is the best one. They differ from *Ch. cancroides* L. in the hand, which is much shorter than tibia and longer than finger, together with numerous other characters taken from minute structure of claws, coxal sac, &c.

3. Chelifer rex, sp. n. (Plate XXIX. figs. 2 *a–e*.)

Male.

Cephalothorax.—One pair of fairly distinct convex *eyes*. Cephalothorax as long as wide behind. Two not very prominent, almost straight transverse *grooves* present. Cephalothorax uniformly and distinctly granular everywhere, but besides on each side provided with at least 20 very small tubercles, each bearing a single very short and distinctly clavate hair.

Abdomen.—The abdomen is moderately slender and depressed, with almost parallel sides. All tergites except the hindmost part of the eleventh with distinct *longitudinal line*. Tergites without trace of longitudinal lateral *keels*. Skin everywhere distinctly *granular* with scale-shaped granules. The first to the eighth tergites each bear along the hindmost margin a row of 14 short, distinctly clavate hairs, while the ninth and the tenth bear only ten or twelve; the third tergite bears in addition to those in the row a lateral hair on each side, in front of the row, while all the following segments bear six hairs in front. The eleventh tergite bears about eight hairs and a number of small round spots, and so does the corresponding sternite (cf. *Ch. imperator*, sp. n., in which the number appears to be greater).

Antennæ.—The terminal hair extends very markedly beyond the *galea*, which is short, suddenly attenuated in terminal third, with three short terminal teeth.

Palps (Pl. XXIX. figs. 2 *a–c*).—The *maxillæ* are scarcely granular at all in the middle, but fairly distinctly so laterally. The palps, with the exception of the fingers, are distinctly granular, especially the three basal joints laterally and above;

the trochanter has in addition to the usual granulations small round tubercles as well as three or four larger eminences; the anterior surface of the femur shows traces at least of similar, though much smaller tubercles, which, like those of the trochanter, carry a single hair. *Hairs* are rather short; those of the trochanter and of the femur, at least dorsally and anteriorly, as well as those of the anterior surface of the tibia, are more or less distinctly clavate, while a few on the posterior surface of the femur, those on the posterior surface of the tibia, as well as those on the hand, are obtuse with one or several terminal teeth; fingers with completely simple and pointed hairs in addition to the tactile ones. The *trochanter*, which has a rather short, but very well-defined stalk, is 1·8 as long as wide; it is wider than the femur as well as the tibia and 1·4 as long as the chela is wide; its anterior outline beyond the stalk is moderately convex, while posteriorly it is slightly convex on the ventral surface, but distinctly produced on the dorsal. The *femur* has a short and fairly well-defined stalk, beyond which it is gradually and fairly distinctly widened out towards the end. It is 4·7 as long as it is wide; anteriorly, beyond the stalk and a scarcely marked short convexity, it is almost straight (or even a little concave), while posteriorly it is slightly convex basally and terminally, but almost straight between. The *tibia*, which is much shorter and a little wider than the femur, has a fairly long and well-defined stalk and is gradually widened out distally; it is 3·4 as long as broad; the anterior outline beyond the stalk is very slightly convex, while the posterior one beyond the insignificant condylus and elongated basal elevation is at first almost straight and then a little convex. The *chela* is 4·4 as long as wide; the *hand*, which is somewhat shorter than the tibia and 1·4 as broad, is almost 2·3 as long as wide, much broader than deep and scarcely 1·1 as long as finger; the lateral outlines are very slightly convex, with the greatest width just beyond the base. The *fingers* gape moderately when closed and have along the margins a row of conical teeth (fig. 2 *b*); the margin of the movable finger has near to the base a ventral elongated *elevation* (*pv*) and opposite to this another much more pronounced dorsal one, bearing about five teeth and fitting into a depression or swelling of the immovable finger (figs. 2 *b–c, pd*), the margin of which is accordingly curved outwards; the immovable finger has just beyond this depression posteriorly near the dentated margin a small tubercle (*pi*). The immovable finger bears anteriorly six and the movable five "*spots*," while both fingers posteriorly bear three spots, arranged as shown in the figure (fig. 2 *c*).

Coxæ (Pl. XXIX. fig. 2 *d*).—They are less elongated than in the preceding species (*cf.* above), especially the third pair, which are as broad as the second interiorly, and not very much widened out; the fourth are long and slender and distinctly widened out from a very short base towards the extremity, where they are scarcely as wide as the third pair; the exterior spine of the fourth pair is represented only by an insignificant short process (*s*), and the posterior margin is almost obtuse-angled.

Coxal sac (Pl. XXIX. fig. 2 *d*).—The coxal sac is small, only about one-third as long as the whole coxa and only occupying an inconspicuous portion of it. Its basal portion, which is almost half as long as the distal, seems in structure to be similar to that of *Ch. mortensenii* With, but has that part of the funnel which consists of fused "cones" very long. The distal portion of the sac is distinctly attenuated from the base, which is wider than the basal portion towards its end; about 15 long and slender setigerous cones, with their hairs directed towards the base and the interior of the sac, are placed along the anterior surface only; the ridges are only poorly developed.

Legs (Pl. XXIX. fig. 2 *e*).—Hairs of the dorsal surface are rather short, slightly clavate or obtuse; those of the ventral side are generally long and slender, almost simple or completely so. Of the *subterminal* hairs only the anterior of the first pair, which is rather straight and apparently with a single tooth, and the anterior of the fourth pair, which is moderately curved and without teeth, are present. A tarsal "*tactile*" hair $\frac{3}{4}$ removed from the base seems to be present. Legs are fairly long and slender; the trochantin of the first pair of legs is much deeper than the femur proper, probably in correspondence to a very wide articular cavity; the *tibia* is scarcely 1·1 as long as the *tarsus*, which is 3·6 as long as deep and gradually attenuated towards the tip from the base, where dorsal and ventral margins are slightly convex. The *femur* of the fourth pair of legs, which is fairly suddenly raised beyond the stalk, is 2·3 as long as deep, 1·3 as long as tibia, and 1·2 lower than tarsus deep. *Claws* bear no teeth; the posterior of first pair much more slender and moderately curved.

Colour.—Palps and cephalothorax generally dark reddish brown; abdominal tergites brown.

Measurements.—Cephalothorax 0·92 (0·92); abdomen 1·73 (1·15) mm.

Palps: trochanter 0·506 (0·280); femur 1·081 (0·230); tibia 0·897 (0·265); hand 0·828 (0·368), depth 0·330; finger 0·782 mm.

Leg I.: femur 0·559 (0·160), trochantin 0·114 (0·182); tibia 0·380 (0·129); tarsus 0·357 (0·099) mm.

Leg IV.: femur 0·737 (0·327); tibia 0·585 (0·152); tarsus 0·403 (0·098) mm.

Female.

Cephalothorax &c.—The cephalothorax is a little longer than wide; transverse grooves, especially hinder, less distinct; the *abdomen* is more cylindrical in shape.

Antennæ.—The terminal hair scarcely extends beyond the *galea*, which has a few terminal teeth.

Palps.—The *trochanter* is 1·6 as long as wide and of a less slender appearance; the other joints scarcely different from corresponding ones of the other sex. The arrangement of the *spots* anteriorly only differs from the male in mere details; the immovable finger has the fourth "spot" placed beyond the median hairs and the two following close together, while the movable has only three spots, two basally and a single one more apart; posteriorly the three "spots" on the movable finger stand more apart. The fingers do not touch each other in the middle when closed, but leave a narrow space between.

Coxæ.—The fourth pair are very similar to those of the preceding species, but even shorter (*cf.* fig. 1 *i*).

Legs.—*Subterminal* hair of the first pair is rather suddenly broken or curved without any tooth anteriorly, while posteriorly it, as in the fourth pair, is moderately curved. The *tarsus I.* is much more slender, being 5·7 as long as deep; the femur of the fourth pair of legs is 2·5 as long as deep and 1·4 lower than tarsus long. The posterior *claw* of the first pair of legs is more slender and less curved than the other claws, but in a smaller degree than in the male.

Measurements.—Cephalothorax 1·08 (1·04); abdomen 2·53 (1·38) mm.

Palps: trochanter 0·529 (0·322); femur 1·219 (0·253); tibia 0·989 (0·299); hand 0·920 (0·414), depth 0·368; finger 0·898 mm.

Leg I.: femur 0·631 (0·175), trochantin 0·122 (0·190); tibia 0·410 (0·114); tarsus 0·388 (0·067) mm.

Leg IV.: femur 0·820 (0·330); tibia 0·646 (0·167); tarsus 0·471 (0·084) mm.

Material.—Of this species I have examined five males and one female, as well as an immature specimen from Brazil.

Remarks.—That the female and the males belong to the same species I regard as certain. I am not quite convinced that the males are quite full-grown, as the first abdominal tergite is longitudinally divided as in the female, while the male of *Lophochernes* has generally the first two tergites undivided; but as well-marked sexual characters are present in the coxæ, tarsi, and maxillar chelæ, I think they are probably mature. This species, which is most remarkable by the curious structure of the male chela, is easily distinguished from *Ch. imperator*, sp. n., as well as from *Ch. cancroides* L., by the unarmed claws.

II. Group of CHELIFER SUBRUBER Sim.

Articular cavity between the two parts of the femur of the first pair of legs not very wide and only slightly oblique, with posterior condylus placed more ventrally than anterior. Fingers of the palps without accessory teeth. Real eyes or ocular spots. "Tactile" hair of tarsus IV. never basal. Male with genital plates of simple structure and its median sternites with differently developed spinous areas.

(*Claws simple and subterminal hair never with teeth. Two distinct transverse grooves. Hairs slightly or strongly clavate. Flagellum consists of four hairs.*)

The characteristics of this group are in the main as set forth in my earlier publication on this theme (*cf.* 20. p. 133). The *eyes* are real or represented by ocular spots; sometimes we find eyes in the females, but ocular spots in the male—for instance, in *Ch. longichelifer* Balz. The *cephalothorax* is more or less granular, with two distinct transverse *grooves*. The tergal sclerites are also granular, with more or less distinctly clavate hairs along the hindmost row in addition to hairs (generally six) in front of the row in the median segments at least. The *genital area* of the male is very similar to that of *Ch. subruber* Sim. (*cf.* 20. p. 121, pl. iii. fig. 7 *b*); the anterior plate, which is wider than long, has a posterior marginal seam, and is shorter, as well as narrower, than the posterior plate; a great number of accessory club-shaped glands are present. The sternites of the males are beset with short *spines*, arranged in well-defined areas; the number of the spines on each segment, the shape of the area in which they are placed, and the number of the sternites, which are adorned with such areas, vary considerably in different species: in *Ch. murrayi* Poc. the fourth to the tenth sternites bear numerous spines, and in *Ch. canestrinii* Balz. only the seventh and the eighth sternites bear areas of a somewhat remarkable structure (*cf.* Ellingsen, 32. pp. 13–14; With, 20. pp. 129, 158, & 162, tab. iii. figs. 7 *b* & 8 *b*; also Pl. XXIX. figs. 3 *a*, 5 *a*, & 6 *a*) *. The *galea* in the female of the South-American species is long and slender, distinctly extending beyond the terminal hair and provided with about five terminal branches, while in the male it extends scarcely at all beyond the terminal hair and its teeth are more or less obsolete; in the two Asiatic species examined the galea has a somewhat different structure (*cf.* 20. tab. iii. figs. 7 *d* & 8 *c–d*). The *flagellum* always consists of four hairs (*cf.* 20. p. 158). The *palps* are generally longer and more slender in the males than in the females, but seldom in so marked a degree as in *Ch. longichelifer* Balz.; the fingers never bear accessory teeth and seldom gape distinctly in the male. The *articulation* between the two parts of the femur of the first pair of legs is very similar to that of *Ch. subruber* Sim., but seems to be somewhat better developed (*cf.* 20. p. 37, figs. 5 *a*, *b*). The articular cavity is not very wide, slightly oblique, with the anterior and posterior condyli opposite to each other, or the latter more dorsally placed. The subterminal hair has no tooth, and the dorsal "tactile" hair of the fourth pair of legs is median or placed beyond the middle; the proximal joints of the legs are more or less granular, and the claws are always simple.

The following 14 species may with certainty be referred to this group, but without doubt the number will be largely augmented by described as well as undescribed species, when naturalists, working at this group, have realised the value of a more thorough investigation. I am disposed to think that the group of *Ch. subruber* Sim. is the central one of the whole subfamily, but before settling the question definitely a comparative-anatomical investigation of the male organs of the different types of *Chelifer* Geoff., as well as of the *Garypidæ* Hans., is absolutely necessary.

From South America: *Chelifer canestrinii* Balz.; *Ch. exilimanus* Balz.; *Ch. insignis*,

* Alb. Tullgren (23. p. 33) writes about *Ch. torulosus* Tullgr., which belongs to the group of *Ch. cancroides* L.:—"Die vordere Ventralplatten scheinen daneben eine transversale Area kurzer Stacheln (wie *Ch. angulatus* Ell.) zu besitzen."

sp. n.; *Ch. longichelifer* Balz.; *Ch. nobilis*, sp. n.; *Ch. proximus* Ell. (?); *Ch. rufus* Balz.; *Ch. satanas*, sp. n.; *Ch. segmentidentatus* Balz.; *Ch. emigrans* Tullgr.

From Europe: *Ch. subruber* Sim.

From Asia: *Ch. subruber* Sim.; *Ch. murrayi* Poc.

From Africa: *Ch. angulatus* Ell.; *Ch. simoni* Balz.; *Ch. tenuimanus* Balz. (?); *Ch. angustatus* Tullgr.; *Ch. concinnus* Tullgr.; *Ch. facetus* Tullgr.; *Ch. lamellatus* Tullgr.; and *Ch. termitophilus* Tullgr.

From Australia: *Ch. subruber* Sim.

Synopsis of Species *.

a. Hand 1·1 as long as finger or shorter.
- *a*[1]. Second thoracic tergite with two white spots. Ocular spots. Chela is 3·5 as long as wide; hand at least 1·1 as long as tibia. Femur IV. 2·5 as long as deep . . . . 6. *Ch. nobilis*, sp. n., ♂.
- *b*[1]. Second thoracic tergite unicolor.
  - *a*[2]. Real eyes. Chela at least 3·4 as long as wide. ♂ tergites not serrated and fingers of palps scarcely gaping. Femur IV. 2·7–3 as long as deep.
    - *a*[3]. Fingers 1·25 as long as hand, which is distinctly shorter than the tibia. Maxillæ almost smooth . . . . . 4. *Ch. proximus* Ell.
    - *b*[3]. Fingers not more than 1·1 as long as hand.
      - *a*[4]. Tibia 1·2 longer than the hand. Maxillæ distinctly granular all over. Femur 5·4 (♂) or 4 (♀) as long as wide and the hand as long as finger. Hairs distinctly clavate. VII.–IX. sternites (♂) with spinous areas not circular and with spines apart . . . . . . 5. *Ch. rufus* Balz.
      - *b*[4]. Tibia as long as hand. Maxillæ almost smooth. Femur 3·7 as long as wide and hand about 1·1 as long as finger. Hairs slightly clavate. VII.–VIII. sternites (♂) with a single one or a pair of circular areas with spines (?) close together . . . . 7. *Ch. canestrinii* Balz., ♂.
  - *b*[2]. Ocular spots. Chela 2·8–3 as long as wide. Tergites of ♂ with hindmost margin serrated, and fingers of palps distinctly gaping. Femur IV. 2–2·2 as long as deep.
    - *a*[5]. Trochanter beneath with long conical process . . 10. *Ch. satanas*, sp. n., ♂.
    - *b*[5]. Trochanter beneath without a conical process . . 9. *Ch. segmentidentatus* Balz.

b. Hand at least 1·2 as long as finger.
- *a*[6]. Femur with basal anterior apophysis; hand 1·1 as wide as tibia and 1·7 as long as finger . . . . 12. *Ch. exilimanus* Balz.

* *Chelifer emigrans* Tullgr. (23. pp. 35–36, fig. 5), from Brazil, certainly belongs to this group. It is similar to *Ch. insignis*, sp. n., by number of tergal hairs in front of row, but differs by wider abdomen and more slender palps.

b^6. Femur without basal apophysis.

a^7. Median abdominal tergites with 8 hairs in front of row. Real eyes. Chela is 3 as long as wide; hand is 1·3 as long as tibia and 1·3 as long as finger . . . . 11. *Ch. insignis*, sp. n., ♀.

b^7. Median abdominal tergites with 6 hairs or less in front of row.

a^8. Femur is 6·3 as long as wide and distinctly widened out towards the extremity. Hand is 1·5 shorter than tibia and 1·5 as long as the finger . . . . 8. *Ch. longichelifer* Balz., ♂.

b^8. Femur not more than 4 as long as wide. Hand 1·2 shorter than tibia and 1·3 as long as finger or less.

a^9. Femur at least 3·5 as long as wide and tibia at least 3 as long as wide. Femur IV. at least 2·5 as long as deep.

a^{10}. Chela at least 3·5 as long as wide. Hand only 1·2 as long as finger.

a^{11}. Hand as long as tibia. Hairs slightly clavate. Second thoracic tergite unicolor. Real eyes. 7. *Ch. canestrinii* Balz., ♀.

b^{11}. Hand much shorter than tibia. Hairs distinctly clavate. Second thoracic tergite with two white spots. Ocular spots . . . . 6. *Ch. nobilis*, sp. n., ♀.

b^{10}. Chela 3·1 as long as wide. Hand 1·3 as long as finger, and 1·1 shorter but 1·6 wider than tibia. Ocular spots (?) . . . . 8. *Ch. longichelifer* Balz., ♀.

b^9. Femur 3·2 as long as wide and tibia about 2·5 as long as wide. Chela 2·8 as long as wide; hand 1·2 as long as finger. Femur IV. 2·2 as long as deep. Ocular spots. 9. *Ch. segmentidentatus* Balz., ♀.

4. Chelifer proximus Ell.

1905. Ellingsen, (19) pp. 324–326.

This species agrees in almost every respect, so far as Mr. Ellingsen's description goes, with *Ch. nobilis*, sp. n., except that it is somewhat smaller, that the fingers are 1·25 as long as the hand, instead of nearly equal to it, and that the second thoracic tergite has no white spots.—Argentine.

5. Chelifer rufus Balz. (Plate XXIX. figs. 3 *a–e*; text-fig. 64.)

1890. Balzan, (10) pp. 431–432, tav. xv. figs. 15–15 *b*.
1891. Balzan, (11) pp. 533–534, pl. xi. fig. 25.
1902. Ellingsen, (15) pp. 158–159.
1907. Tullgren, (23) p. 37.

Male.

Cephalothorax.—Fairly distinct, moderately curved. Real *eyes.* Cephalothorax distinctly longer than wide behind. Two fairly distinct, almost straight transverse grooves. Distinctly and coarsely granular all over; strongly clavate hairs, somewhat similar to scales of a butterfly, found in numbers.

Abdomen (Pl. XXIX. fig. 3 *a*).—All tergites longitudinally divided, but the first three very indistinctly so. Sclerites as well as lateral dorso-ventral margin distinctly granular. About 10 strongly clavate hairs are placed along posterior margin, and 4–6 in front of row on the hindmost (VI.–X.) tergites; XI. tergite bears in addition to two rows of clavate hairs a pair of not very long simple "tactile" hairs (*cf.* Ellingsen, 15. p. 158). About *genital area*, cf. p. 229.

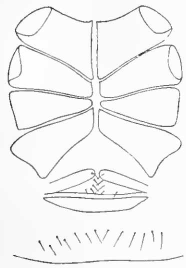
The IV.–VI. *sternites* are longitudinally divided and so are sometimes the X.–XI.; the VIII. sternite is undivided or shows a trace of longitudinal division in anterior fifth only; the VII. is either completely divided or shows only trace of division anteriorly and so generally does the IX. sternite. The sternites are smooth in the middle, but granular laterally. The VIII. sternite is longer than any of the others and has in the middle an almost semi-ellipsoidal pale area, which has its anterior convex margin fairly well marked off from the surrounding darker skin, and its hinder margin, which is a trifle convex, fairly well raised and distinctly chitinised; this area occupies $\frac{1}{3}$ of breadth of the sternite and $\frac{3}{4}$ of its length. It possesses in addition to the usual hairs about 50 short spines, placed within well-marked rings, crowded in the middle but standing more apart laterally. The VII. and IX. sternites show areas of similar appearance, possessing about 15 or 20 spines respectively, but less distinctly limited laterally; but these areas almost disappear in specimens in which the corresponding sternites are completely divided, and the spines are then placed interiorly near the posterior margin in each half of the sclerite (fig. 3 *a*). In this species it thus seems evident that the spinous area forms part of the sclerite and does not stand between its two halves.

Antennæ.—The terminal hair extends beyond the short acute *galea* without distinct teeth (*cf.* Ellingsen, 15. p. 159).

Palps (Pl. XXIX. fig. 3 *b*).—The *maxillæ* are distinctly granular all over and so are the palps with the exception of the fingers. Hairs strongly clavate and rather short on trochanter and femur, less distinctly so on tibia and hand. The *trochanter*, which has a short, but well-defined stalk, is 1·5 as long as wide; the anterior outline is distinctly convex, while posteriorly it is produced ventrally, and even more so dorsally, so that it appears bigibbose. *Femur* has a short, not well-limited stalk, beyond which it is distinctly widened out towards the tip. It is almost 5 as long as wide; anteriorly beyond a very short basal elevation it is very slightly concave; posteriorly it becomes gradually convex just beyond the stalk and towards the termination, but between it is almost straight. The *tibia*, which is distinctly shorter and wider than the femur, has a short, very well-defined stalk and is 3·3 as long as wide; the anterior outline beyond the stalk is slightly convex, with the greatest curvature near the base, terminally it even becomes a trifle concave; posteriorly beyond the low condylus and fairly well-marked basal elevation it is slightly concave and then terminally moderately convex.

The *chela* is 3·7 as long as wide; the hand, which is distinctly narrower than the trochanter is long, is 1·2 shorter but 1·4 wider than tibia, is almost 1·8 as long as wide, distinctly wider than deep, and scarcely as long as fingers, which only gape a trifle, when closed. The *immovable* finger possesses anteriorly only a single "*spot*," placed just beyond and beneath the third tactile hair, which is placed almost in the middle; the immovable finger has three spots posteriorly and the movable two only, arranged as figured (fig. 3 *b*).

Text-fig. 64.



Ch. rufus Balz., ♂. Coxæ and sexual area. × 57.

Coxæ (text-fig. 64).—The second pair are distinctly widened out from the rather short interior margin and become rather suddenly attenuated towards the base, while the third pair are distinctly triangular, the inner margin being a mere point. The fourth pair are fairly long and distinctly widened out, of somewhat triangular appearance, as the fairly long interior margin is not well limited from the much longer moderately concave posterior one; the anterior margin is also somewhat concave basally.

Legs (Pl. XXIX. figs. 3 *c–e*).—Proximal joints, at least, with scale-shaped granules; the hairs are moderately long and more or less strongly clavate dorsally except in tarsus terminally; ventrally they vary from distinctly clavate to pointed and almost simple. A short "*tactile*" hair is present on tarsus IV., $\frac{3}{4}$ removed from the base. The *trochantin* of the first pair of legs is somewhat wider than the femur proper, and the articulation is poorly developed, only with an anterior median tooth as well as a posterior more dorsally placed, where the margin of the trochantin overlaps the base of the following joint. The *tarsus*, which is of almost equal length with the tibia, is distinctly 5 as long as deep. The *femur* of the fourth pair of legs, which is raised fairly gradually beyond the stalk, is three times as long as deep, scarcely 1·1 as long as tibia, and almost 2·5 as low as tarsus is long.

Colour.—Palps are reddish brown, and body, especially cephalothorax, darker brown.

Measurements.—Cephalothorax 0·690 (0·598); abdomen 1·196 (0·805) mm.

Palps: trochanter 0·299 (0·184); femur 0·690 (0·138); tibia 0·598 (0·184); hand 0·483 (0·265), depth 0·230; finger 0·483 mm.

Leg I.: femur I. 0·365 (0·114), trochantin 0·099 (0·120); tibia 0·296 (0·076); tarsus 0·296 (0·056) mm.

Leg IV.: femur 0·456 (0·152); tibia 0·426 (0·091); tarsus 0·372 (0·068) mm.

Female.

Abdomen &c.—Number of hairs along posterior margin of tergites greater (viz. 12), and often also a greater number in front of row. The *galea* is longer and more slender, with six terminal teeth, and distinctly extending beyond the terminal hair (*cf.* Balzan's fig. 15 *a*, ♀).

Palps are less slender; the femur and tibia, for instance, being 4 and 3 times as long as wide respectively; the chela is 3·4 as long as wide; the hand is comparatively broader and perhaps a little longer than the finger; "spots" are anteriorly as in the male.

Coxæ.—The fourth pair are perhaps less widened out; interior margin better marked and posterior less concave.

Legs.—The legs are somewhat less slender, except the *tarsus* of the first pair, which is 5·5 as long as deep and a trifle longer than the tibia. The *femur* of the fourth pair of legs is scarcely 3 as long as deep and only 2·1 lower than tarsus long.

Measurements.—Cephalothorax 0·690 (0·575); abdomen 1·725 (0·920) mm.

Palps: trochanter 0·345 (0·230); femur 0·736 (0·184); tibia 0·647 (0·220); hand 0·552 (0·322), depth 0·280; finger 0·529 mm.

Leg I.: femur 0·418 (0·133), trochantin 0·106 (0·140); tibia 0·319 (0·084); tarsus 0·334 (0·061) mm.

Leg IV.: femur 0·517 (0·182); tibia 0·464 (0·106); tarsus 0·380 (0·068) mm.

Material.—Dr. F. Meinert collected 5 males and 5 females of this pretty little species in Venezuela from June to December.

The species has been recorded by previous authors from practically the whole of South America, viz. Argentine, Paraguay, Brazil, Venezuela, and Ecuador.

Remarks.—The male is easily distinguished from all other species of this group hitherto described by the structure of the sternal areas; the female may be most easily distinguished from other species with finger of almost equal length to the hand by the distinctly granular maxillæ and tibia, which latter is longer than the hand (*cf.* Ellingsen, 19. pp. 325–326).

6. Chelifer nobilis, sp. n. (Plate XXIX. figs. 4 *a–b.*)

Cephalothorax.—Eyes are, in the specimen examined, represented by rather indistinct *ocular* spots. Cephalothorax distinctly longer than wide behind. Two almost straight *transverse grooves,* of which the posterior is rather inconspicuous. Distinctly and coarsely granular all over and provided with short strongly clavate hairs.

Abdomen.—All tergites with indistinct longitudinal line. Skin moderately granular; short, distinctly clavate hairs, probably 10 in number, along the hindmost margin together with a few in front of the row. The sternites are longitudinally divided, except the VII.–VIII., which have the median fourth covered by a pale area, about two-thirds of the sternite in length. These areas are irregularly and rather indistinctly limited in front, but fairly well-defined behind, as they here form part of the hinder margin of the sclerite. The eighth sternite is not so well chitinised as in *Ch. rufus* Balz. (*cf.* above). Number of spines 25 and 50.

Antennæ.—The *galea* is rather short and thick, with about five short terminal teeth, and extends perhaps in a slight degree beyond the terminal hair.

Palps (Pl. XXIX. figs. 4 *a–b*).—The *maxillæ* are almost smooth in the middle, but granular laterally; the palps are distinctly granular all over, with the exception of the fingers and part of the hand on the under surface. The hairs are fairly long and moderately clavate on the trochanter and femur; these hairs pass gradually into those of the tibia and hand, which are slightly clavate or obtuse. The *trochanter*, which has a short and well-defined stalk, is 1·7 as long as wide; the anterior outline is distinctly convex, while the posterior is slightly produced ventrally and dorsally rises into a rather high, strongly rounded protuberance. The *femur* has a fairly long, badly defined stalk, beyond which it is distinctly widened out to a point somewhat behind the middle. It is about 4 times as long as wide; anteriorly beyond a low and short basal elevation it is moderately concave, while posteriorly it becomes gradually slightly convex just beyond the stalk and again towards its termination, but between it is almost straight. The *tibia*, which is distinctly wider and shorter than the femur, has a fairly long and well-defined stalk and is about 3 as long as broad; the anterior outline beyond the stalk is very slightly convex and then towards the tip a trifle concave, while the posterior beyond the condylus and elongated fairly distinct basal elevation is straight or slightly concave and then moderately convex. The *chela* is 3·5 as long as wide; the *hand*, which is distinctly narrower than the trochanter is long, is scarcely 1·2 as short as but 1·5 as wide as tibia; it is 1·8 as long as wide, distinctly wider than deep, and scarcely 1·1 as long as fingers, which scarcely gape when closed. *Anteriorly* no "*spots*" were observed, but posteriorly the immovable finger has three and the movable one, as figured (fig. 4 *b*).

Coxæ.—The coxæ scarcely differ from those of *Ch. rufus* Balz. (*cf.* text-fig. 64).

Legs.—The femora and tibiæ, at least, with scale-shaped granules; the hairs are fairly long and dorsally more or less distinctly clavate; most distinctly so in the femur and tibia of the fourth pair of legs; ventrally they are pointed and almost or completely simple. The trochanters as well as the trochantins of the legs possess a longer and more slender hair on the ventral surface. A tarsal "*tactile*" hair is present $\frac{3}{4}$ removed from the base and a little longer than distance to tip. The *trochantin* of the first pair of legs is somewhat wider than the femur proper and has an articulation like that in the preceding species. The tibia, which is rather short and clumsy, is 1·1 as long as the *tarsus*, which is 4·4 as long as deep. The *femur* of the fourth pair of legs is 2·5 as long as deep, 1·1 as long as tibia, and 1·6 lower than tarsus long.

Colour.—Palps are reddish brown. Cephalothorax is dark brown, with two yellowish spots on second tergite; the abdominal tergites are lighter brown, each with a yellowish spot on each half.

Measurements.—Cephalothorax 0·805 (0·647); abdomen 1·610 (0·920) mm.

Palps: trochanter 0·391 (0·230); femur 0·805 (0·195); tibia 0·713 (0·230); hand 0·621 (0·345), depth 0·299; finger 0·575 mm.

Leg I.: femur I. 0·448 (0·160), trochantin 0·106 (0·167); tibia 0·334 (0·106); tarsus 0·304 (0·068) mm.

Leg IV.: femur IV. 0·585 (0·228); tibia 0·509 (0·133); tarsus 0·372 (0·076) mm.

Material.—Of this species I have examined a single badly preserved male from Bogota (Keyserling's Collection).

Variation.—Besides the specimen mentioned I have examined another male from New Granada (Keyserling's Collection), which in some respects varied rather considerably. The *galea* is longer and more slender. The maxillæ slightly granular in the middle. The proportions between the joints of the palps somewhat different, as *femur* is 4·2 as long as wide, tibia 3·3 and hand 1·2 as long as finger; the immovable finger bears anteriorly at least two "spots" in the middle, and the movable finger three spots near to the ventral margin. The legs are more slender, as the *tarsus* of the first pair of legs is at least as long as the tibia, and the femur of the fourth pair is 2·8 as long as deep and 2 as low as tarsus. I give for comparison the measurements of the palps: trochanter 0·368 (0·230); femur 0·966 (0·230); tibia 0·828 (0·253); hand 0·690 (0·368); finger 0·575.

Remarks.—Taking into consideration the scanty material examined, I do not consider the above-mentioned differences sufficiently important to establish two species.

From *Chelifer proximus* Ell. (*cf.* 19. pp. 324–326) this species differs only in colour and the length of the finger, which is shorter, not much longer than the hand. From *Ch. rufus* Balz. it differs in the structure of the sternal areas, in the less distinctly granular maxillæ, and in the less slender palps (especially femur and finger); from *Ch. canestrinii* Balz. in the structure of the sternal areas and the shorter hand.

7. Chelifer canestrinii Balz. (Plate XXIX. figs. 5 *a–d.*)

1890. Balzan, (10) pp. 430–431, tav. xv. figs. 14–14 *c*.
1891. Balzan, (11) p. 532, pl. xi. figs. 22–22 *a*.
1905. Ellingsen, (18) pp. 16–17.
1905. Ellingsen, (19) p. 324.

Cephalothorax.—Distinct *eyes.* Cephalothorax distinctly longer than wide, with very broad and almost straight transverse grooves. Distinctly granular all over, with short clavate hairs.

Abdomen (Pl. XXIX. fig. 5 *a*).—All tergites with more or less distinct longitudinal line and distinctly granular; the short clavate hairs, in number from 10–14, are placed along the hindmost margin, and the median and hindmost segments possess in addition to these generally six hairs in front of the row. All the *sternites* from the fourth to the tenth are longitudinally divided, and are smooth or almost so in the middle, but laterally are slightly granular. In the seventh and eighth segments the longitudinal line is widened out behind, and in the wide pale area so formed are situated in the seventh segment two circular bodies, and in the eighth segment one (fig. 5 *a*).

Each of these bodies is composed of very small rings, placed close together, the two small ones on the seventh sternite consisting of 20 each, and the single bigger one on the eighth sternite composed of 50. No spines were observed placed within these rings as in other species of this group, but nevertheless in all probability they are present.

Antennæ.—The terminal hair extends in a slight degree beyond the *galea*, which has five short distal teeth.

Palps (Pl. XXIX. figs. 5 *b–c*).—The *maxillæ* are smooth in the middle, but laterally slightly granular; the palps are distinctly granular, with the exception of the fingers and part of the hand below. The rather short hairs are moderately clavate on the trochanter and femur, slightly so on the tibia, and only obtuse on the hand. The *trochanter*, which has a short, well-defined stalk, is 1·8 as long as wide; the anterior surface is distinctly convex, while the posterior surface is only slightly convex below, but above is fairly distinctly produced. *Femur* has a short, not well-limited stalk, beyond which it is of almost equal width throughout. It is scarcely 3·7 as long as wide; anteriorly it is almost straight; posteriorly slightly convex basally and terminally, but straight between. The *tibia*, which is little, but yet distinctly, wider than the femur, has a fairly short and well-defined stalk and is scarcely three times as long as broad; the anterior outline beyond the stalk is very slightly convex, while the posterior beyond the small condylus and fairly well-marked basal elevation is straight and then slightly convex. The *chela* is about 3·9 as long as wide; the *hand*, which is distinctly narrower than the trochanter is long, is only a little shorter than, but 1·3 as broad as, tibia; it is distinctly twice as long as wide, somewhat wider than deep, and about 1·1 as long as fingers, which do not gape when closed. The immovable finger has anteriorly only a single "*spot*," placed between the basal and the median tactile hairs, but posteriorly three spots (fig. 5 *c*); the movable finger only bears three spots, placed close together posteriorly.

Coxæ (Pl. XXIX. fig. 5 *d*).—The first two pairs are not in any marked degree different from those of *Ch. rufus* Balz. (*cf.* text-fig. 64), but the third is less distinctly triangular, as the inner margin is rounded and not pointed; the fourth pair differ distinctly in possessing a markedly less concave posterior margin.

Legs.—Proximal joints at least with scale-shaped granules. The hairs of the dorsal side of the femur, the tibia, and basally even the tarsus of the fourth pair of legs are more or less distinctly clavate, while the corresponding hairs of the first pair are obtuse and dentated; hairs of ventral side pointed and more or less simple; the trochanters as well as the trochantins possess ventrally a very long and slender hair. A tarsal "*tactile*" hair, scarcely one-fourth removed from the end and almost twice as long as this distance, is present. The *trochantin* of the first pair of legs is somewhat wider than the femur proper, and the articulation is like that previously described (*cf.* above); the *tarsus* is a little longer than the tibia and 4·2 as long as deep. The *femur* of the fourth pair of legs is 2·7 as long as deep, almost 1·3 as long as tibia, and 2 as low as tarsus long; the latter is only a trifle shorter than the tibia. Legs as a whole of less slender appearance than those of *Ch. rufus* Balz. (*cf.* figs. 3 *c–e*).

Colour.—Palps and cephalothorax reddish brown with darker transverse grooves, and abdominal tergites paler brown.

Measurements.—Cephalothorax 0·620 (0·575); abdomen 1·265 (0·805) mm.

Palps: trochanter 0·285 (0·161); femur 0·598 (0·175); tibia 0·560 (0·195); hand 0·506 (0·240), depth 0·225; finger 0·460 mm.

Leg I.: femur 0·395 (0·137), trochantin 0·110 (0·152); tibia 0·251 (0·084); tarsus 0·258 (0·061) mm.

Leg IV.: femur 0·441 (0·162); tibia 0·334 (0·107); tarsus 0·327 (0·068) mm.

Material.—I have examined two males, viz., one of Mr. Ellingsen's original specimens and one collected by Dr. F. Meinert at La Moka in the month of August. The species has also been recorded from Paraguay, Venezuela, Brazil, and Ecuador.

Variation.—A smaller and paler specimen in the British Museum showed a few features worth recording. The seventh sternite possessed only a single circular area, somewhat smaller than that of the following segment, instead of two. The immovable finger had posteriorly four spots instead of three, and the movable two instead of three. As no other differences were observed, this animal is most naturally referred to *Ch. canestrinii* Balz. The label mounted with the specimen reads "Balthazar (Windward), Island of Grenada, 250 feet, Aug. 8. Open place under piles of rotting weeds."

Remarks.—This species is easily distinguished from the two preceding as well as from *Ch. proximus* Ell. by the less slender femur and the longer hand; from the latter species also by the much shorter fingers. The male is easily distinguished from all species examined by me by the structure of the sternal areas.

8. Chelifer longichelifer Balz. (Plate XXIX. figs. 6 *a–d.*)

1890. Balzan, (10) pp. 433–434, tav. xv. fig. 16 (♂ ♀) –16 *c.*
1891. Balzan, (11) p. 534, pl. xi. figs. 26, ♂ ♀.
1905. Ellingsen, (19) p. 324.
1907. Tullgren, (23) p. 35.

Male.

Cephalothorax.—Two rather indistinct *eyes*, or, perhaps more correctly, ocular spots only. Cephalothorax is distinctly longer than wide, almost as wide in the anterior third as behind, but beyond distinctly attenuated. The two transverse *grooves* are generally rather indistinct; the anterior is almost straight in the middle, but the posterior is slightly curved forwards. Distinct and rather pointed granules are found everywhere except on the white spot, which covers the median portion of the second tergite; short, distinctly clavate hairs are found in numbers.

Abdomen (Pl. XXIX. fig. 6 *a*).—Rather depressed abdomen, not very much longer than wide. All the tergites, except the eleventh and perhaps the first, are longitudinally divided. The sclerites are distinctly *granular*, with scale-shaped granules on all the dark-coloured portions, with the exception of the whole first tergite and a very wide longitudinal band, which decreases towards the tip of the abdomen, in correspondence to the gradual development of granulations along the anterior margin; the eighth and ninth tergites, for instance, are almost entirely granular, while the two following are completely so. The tergites possess along the hindmost margin a row of from 10–12 moderately long and clavate hairs, in addition to 6 in front of the row on the V.–X. segments; the eleventh tergite has at least one pair of long slender "tactile" hairs.

The *genital area* appears almost completely similar to that of *Ch. rufus* Balz. (*cf.* text-fig. 64). The sternites are almost smooth in the middle, but slightly granular laterally; the eleventh bears two pairs of "tactile" hairs; the IV.–X. sternites are longitudinally divided. This longitudinal line is in the VII.–IX. sternites widened out, so that an almost circular pale area is established (Pl. XXIX. fig. 6 *a*); within each of these areas spines are placed rather apart from each other in a varying number (from about 15–25), which is always greatest in the eighth sternite and smallest in the seventh.

Antennæ.—The terminal hair extends in a small degree beyond the short *galea*, with a few short teeth (*cf.* 10. fig. 16 *b*, ♂).

Palps (Pl. XXIX. figs. 6 *b–c*).—The *maxillæ* are almost smooth in the middle, distinctly granular laterally; the trochanter is distinctly granular above, while the other joints are almost or completely smooth. The short *hairs* of the trochanter, and the femur partly, are moderately clavate, while those of tibia and hand are slightly clavate or obtuse. The palps are exceedingly long and slender, much longer than the body. The *trochanter*, which has a fairly long and well-defined stalk, is almost 2·3 as long as wide; the anterior surface is very slightly convex, while the posterior is almost straight, ventrally and dorsally produced into a low rounded protuberance. The *femur* has a short, not well-limited stalk, beyond which it is gradually, but in a very high degree, widened out towards the end. It is 6·3 as long as wide; anteriorly beyond a short and low basal elevation it is almost straight, and so it is posteriorly, but for a slightly marked convexity terminally. The *tibia*, which is as long, but scarcely as wide, as the femur, has a rather short well-defined stalk and is 6·4 as long as wide; the anterior surface beyond the stalk is slightly convex, while the posterior beyond the well-marked basal elevation is moderately concave; the whole joint is very much widened out towards the extremity. The *chela* is 4·7 as long as wide; the *hand*, which is 1·7 narrower than the trochanter is long, is 1·5 as short as and 1·6 wider than the tibia; it is 2·8 as long as wide, somewhat wider than deep, and 1·5 as long as the fingers, which gape a trifle when closed; the lateral outlines are slightly convex, with the greatest curvature towards the middle. The *immovable* finger has a single "*spot*" anteriorly just beneath the median tactile hair, while posteriorly it has five spots arranged as shown in fig. 6 *c*; the movable finger has three spots only, arranged somewhat behind and a little in front of the median tactile hair.

Coxæ.—The coxæ resemble in structure those of *Ch. rufus* Balz., but the second pair have the interior margin much shorter and consequently appear more triangular, while the third pair are scarcely different, the interior margin being a mere point; the fourth pair have a more triangular appearance than in *Ch. rufus* Balz., as the inner margin is very short and the hinder almost straight.

Legs.—Proximal joints are very indistinctly granular. The rather short hairs are dorsally slightly clavate or obtuse, except on the tarsus terminally; ventrally they are obtuse or pointed, simple or almost simple; the trochanter and trochantin possess one long slender hair on the ventral surface; the tarsal "*tactile*" hair is two-thirds removed from the base and much longer than this distance to the end. For the structure of the femur of the first pair of legs I refer to *Ch. rufus* Balz.; the tibia is 1·2 as long as the *tarsus*, which is 4·9 as long as deep. The *femur* of the fourth pair of legs is 2·6 as long as deep, almost 1·2 shorter than tibia and 1·6 lower than the tarsus is long.

Colour.—The colour is very characteristic. The palps are yellowish brown with dark brown chela; the cephalothorax is dark brown, sometimes almost blackish, with a white spot, which almost covers the median portion of the second tergite. The lateral parts as well as the tip of the abdomen are greenish brown, while the middle is adorned with a white band in continuation of the thoracic one, almost completely covering the first abdominal tergite and decreasing in width towards the end.

Measurements.—Cephalothorax 0·828 (0·598); abdomen 1·051 (0·736) mm.

Palps: trochanter 0·437 (0·195); femur 1·081 (0·175); tibia 1·081 (0·169); hand 0·713 (0·253), depth 0·230; finger 0·483 mm.

Leg I.: femur 0·456 (0·152), trochantin 0·099 (0·160); tibia 0·342 (0·099); tarsus 0·281 (0·053) mm.

Leg IV.: femur 0·562 (0·220); tibia 0·471 (0·110); tarsus 0·357 (0·065) mm.

Female.

Abdomen.—The granulation is more uniformly distributed all over, as the white longitudinal band is less developed.

Antennæ.—The *galea* is very nearly the same as in the male, but extends distinctly beyond the terminal hair.

Palps (Pl. XXIX. fig. 6 *d*).—Not only trochanter, but also interior surfaces of the tibia and femur fairly distinctly granular. The *trochanter*, which is 1·9 as long as wide, has the anterior outline more distinctly convex. The *femur*, which is about 3·8 as long as wide, is less distinctly widened out towards the extremity. The *tibia*, which is somewhat shorter and broader than the femur, has a short and fairly well-defined stalk and is 3·2 as long as wide; anteriorly it is very slightly convex, and posteriorly beyond the short basal elevation almost straight. The *chela* is 3·1 as long as wide; the hand, which is as wide as the trochanter is long, is scarcely 1·1 shorter than the tibia, but 1·6 broader; it is 1·8 as long as wide, as wide as deep, and 1·3 as long as fingers, which scarcely gape when closed; lateral outlines moderately convex, with most raised part just beyond the stalk. The number of "spots" anteriorly is as in the male, but posteriorly slightly differs, as seen in fig. 6 *d*.

Coxæ.—The second and the third pair are less distinctly triangular, as the interior margins are longer; the fourth pair are quite dissimilar and distinctly quadrangular, as the interior margin is well developed, scarcely shorter than the exterior and only 1·5 shorter than the posterior.

Legs.—The granulation is better marked; the proportions between the joints differ in a slight degree, as the tibia of the first pair is scarcely 1·1 as long as the *tarsus*, which is about 4·7 as long as deep, and *femur IV.* is only 2·4 as long as deep.

Colour.—The colour is sometimes fairly similar to that of the male, but with white spots on the second thoracic tergite and white band on the abdomen less prominent; in other cases scarcely any difference whatever.

Measurements.—Cephalothorax 0·621 (0·552); abdomen 1·38 (0·805) mm.

Palps: trochanter 0·299 (0·161); femur 0·690 (0·184); tibia 0·621 (0·195); hand 0·575 (0·322), depth 0·322; finger 0·437 mm.

Leg I.: femur 0·403 (0·127); trochanter 0·091 (0·132); tibia 0·296 (0·079); tarsus 0·281 (0·060) mm.

Leg IV.: femur 0·501 (0·205); tibia 0·410 (0·110); tarsus 0·342 (0·068) mm.

Material &c.—Of this species I have examined a number of specimens, viz., 3 females collected by Dr. W. Sörensen at Riacho dell' Oro, and 12 males and 3 females collected by Dr. Fr. Meinert in Venezuela, for instance, at Caracas under bark of Bombax in the month of June, in rotten branches with termites, Los Trinchéras, in the month of November, La Moka, by sifting in August, and San Estéban. Previously it had been recorded from Paraguay, Brazil, Venezuela, and Ecuador.

Remarks.—It is not without hesitation that the species described is referred to *Ch. longichelifer* Balz., for Balzan writes in his description "Il trocantere è eguale nei due sessi, multo più lungo che largo," while the difference in the length of the trochanter is very marked in the two sexes; but as Balzan's own figures (11. figs. 26, ♂ ♀) show some difference, I think that Balzan's original specimens must be examined before settling the question definitively. Other variations found in the proportions of joints of the palps—for instance, tibia a little wider than femur—are probably of small importance. That Balzan has not mentioned the very characteristic colour in the male may perhaps be explained by the bad preservation or the age of his few specimens. On full consideration it would be premature to establish a new species. The species is easily distinguished in both sexes by the slender femur and short fingers.

9. CHELIFER SEGMENTIDENTATUS Balz. (Plate XXIX. figs. 7 *a–j*; text-fig. 65.)

1890. Balzan, (10) pp. 428–430, tav. xiv. figs. 13 (♂ ♀)–13 *b*.
1891. Balzan, (11) p. 548.
1905. Ellingsen, (19) pp. 12–13.

Male.

Cephalothorax.—Indistinct *ocular* spots present. The cephalothorax is much longer than broad behind, where it is broadest. The *transverse grooves* are very deep and prominent; they are almost straight in the middle, but laterally the anterior is directed forwards and the posterior backwards. Skin coarsely granular everywhere, and provided with short distinctly clavate hairs. The second tergite is gradually raised towards its posterior serrated margin.

Abdomen (Pl. XXIX. fig. 7 *a*).—The abdomen is of a slender appearance, being at least twice as long as broad; sclerites increase in length as well as in breadth towards the sixth one, and then decrease towards the end. All the tergites divided by a longitudinal line, which is almost obsolete on the first two at least. The first five tergites show traces of lateral keels and the *first eight* have the posterior margin of the sclerites irregularly undulated and serrated. The sclerites are distinctly granular all over, and bear a row of short fairly distinctly clavate hairs numbering from 10–12 along the posterior margin of the median segments, in addition to 6 in front of the row; the XI. tergite possesses probably a pair of "tactile" hairs.

Sternites without longitudinal line. The posterior portion of the VI.–VII. sclerites is rather pale and is provided with a few short spines, while the two following sternites show an area with a convex anterior margin, as long as $\frac{2}{3}$ and as wide as $\frac{1}{3}$ of the whole sclerite, which is beset with a large number (c. 80) of rather long spines standing close together.

Antennæ.—The terminal hair scarcely extends beyond the *galea*, which is suddenly attenuated and provided with a few almost obsolete teeth (*cf.* Balzan, fig. 13 *b*, ♂).

Palps (Pl. XXIX. figs. 7 *b–e*).—The *maxillæ* are smooth in the middle, but laterally and in front slightly granular; the palps are fairly distinctly granular above, with the exception of the almost smooth hand; on the under surface only the proximal joints are slightly granular; the hand, like the fingers, is completely smooth. The trochanter and the femur are provided with a number of rather long or distinctly clavate *hairs*, placed along the concave basal portion of the anterior surface of the latter joint; the hairs of the tibia as well as the hand are slightly clavate or even obtuse. The *trochanter*, which has a rather short and distinct stalk, is 1·6 as long as wide; the anterior surface is moderately but somewhat irregularly convex, while the posterior has the ventral margin slightly produced, and dorsally distinctly so into a low conical protuberance, so that the trochanter appears bigibbose. The *femur* has a short fairly well-limited stalk, beyond which it is only slightly widened out towards the end. It is four times as long as wide; anteriorly beyond a low basal elevation it is first moderately concave and then almost straight, while posteriorly it is slightly convex basally and terminally, but almost straight between. The *tibia*, which is as long as, but distinctly wider than, the femur, has a long well-defined stalk, and is 2·6 as long as wide. The anterior outline is moderately convex, while the posterior beyond the only slightly pronounced basal elevation is first straight and then slightly convex. The *chela* is 2·8 as long as wide; the *hand*, which is distinctly wider than the trochanter is long, is almost 1·2 as short as and 1·5 as wide as the tibia; it is 1·4 as long as broad, as wide as deep, and scarcely 1·1 shorter than the fingers, which gape considerably when closed: the outlines of the hand are strongly convex. The *immovable* finger bears marginal teeth in the distal half, while the movable has only blunt teeth terminally; anteriorly the immovable finger has a single "*spot*" beneath the median hair, and posteriorly three spots (*cf.* figs. 7 *d–e*), while the movable finger has two spots anteriorly, but three posteriorly.

Coxæ (Pl. XXIX. fig. 7 *f*).—The second pair, and still more markedly the third pair, have short interior margins and consequently appear triangular; in the fourth pair the rather short interior margin gradually merges into the concave posterior one; it is distinctly enlarged towards the extremity, appears triangular, and has the postero-exterior corner produced backwards as a short point.

Legs (Pl. XXIX. figs. 7 *g–i*).—The proximal joints are granular; dorsally the legs bear rather short hairs, which are distinctly clavate in the fourth pair of legs, but only moderately or slightly so in the first pair; ventrally they are pointed, and more or less simple, in the fourth pair of legs as well as terminally in the first pair; trochanters and trochantins with usual "tactile" hairs; a tarsal "*tactile*" hair, $\frac{2}{3}$ removed from the base, perhaps present. The trochantin, which is less deep than the femur proper, is articulated to it in the usual way (fig. 7 *h*, cf. *Ch. rufus* Balz.); the tibia is scarcely 1·1 as long as the *tarsus*, which is about 4·5 as long as deep. The *femur* of the fourth pair of legs, which is very abruptly raised beyond the stalk and somewhat attenuated towards the end, is almost twice as long as deep, 1·2 as long as tibia, and 1·2 lower than tarsus long. The legs are, as a whole, exceedingly short and clumsy.

Colour.—Palps yellowish brown with darker fingers; body dorsally darker brown.

Measurements.—Cephalothorax 0·647 (0·460); abdomen 1·449 (0·647) mm.

Palps: trochanter 0·253 (0·161); femur 0·506 (0·125); tibia 0·506 (0·195); hand 0·414 (0·299), depth 0·299; finger 0·437 mm.

Leg I.: femur 0·334 (0·137), trochantin 0·076 (0·129); tibia 0·258 (0·084); tarsus 0·243 (0·053) mm.

Leg IV.: femur 0·426 (0·217); tibia 0·365 (0·106); tarsus 0·274 (0·068) mm.

Variation.—Another, probably a young male, was distinctly smaller, had the posterior margin of the abdominal tergites more regularly serrated; the hand comparatively narrower, and the space left between the fingers when closed much smaller; fingers comparatively shorter.

Female.

Cephalothorax.—The transverse *grooves* are less prominent and the anterior appears more curved backwards, as it is laterally directed forwards.

Abdomen.—The abdomen appears less slender, as it is scarcely twice as long as broad. The tergites show no trace of serrated posterior margin; the longitudinal line is not visible in the first three and the last tergites, and is only slightly pronounced in those between. The tergites are not very distinctly granular and have a greater number of hairs along the hindmost margin, viz., about 14; the eleventh tergite has a pair of long slender "tactile" hairs.

Antennæ.—The exceedingly long, slender, cylindrical *galea*, which has about six short terminal branches, extends very much beyond the terminal hair (*cf.* 10. fig. 13 *b*, ♀).

Palps.—The hairs are perhaps somewhat shorter than in the male. Anteriorly the *trochanter* is slightly and regularly convex, posteriorly less distinctly bigibbose than in the male. The *femur*, which is more distinctly widened out towards the end, is 3·2 as long as broad; anteriorly beyond the stalk it is almost completely straight. The *tibia* is shorter than the femur and 2·4 as long as wide. The *hand*, which is only a little shorter than, but 1·4 as long as the tibia, is 1·6 as long as broad, a little wider than deep, and 1·2 as long as fingers, which scarcely gape when closed; "spots" anteriorly are arranged almost as in the male.

Coxæ (Pl. XXIX. fig. 7 *j*).—The fourth pair of coxæ are of a more quadrangular appearance, as they are only in a slight degree widened out towards the end, and the interior margin is fairly long and well defined from the concave hinder one; the postero-exterior corner is scarcely produced.

Text-fig. 65.

Ch. segmentidentatus Balz., ♀. Femur of left leg IV. in anterior view. × 57.

Legs (text-fig. 65).—The femur of the fourth pair of legs is less abruptly raised beyond the stalk, is more slender, viz., 2·2 as long as deep, 1·1 as long as tibia, and 1·5 lower than tarsus long.

Colour.—Colour of the cephalothorax, but especially of the yellowish abdomen, much lighter.

Measurements.—Cephalothorax 0·575 (0·414); abdomen 1·104 (0·667) mm.

Palps: trochanter 0·253 (0·161); femur 0·506 (0·150); tibia 0·460 (0·190); hand 0·437 (0·276), depth 0·253; finger 0·368 mm.

Leg I.: femur 0·312 (0·122), trochantin 0·083 (0·122); tibia 0·236 (0·079); tarsus 0·182 (0·049) mm.

Leg IV.: femur 0·418 (0·187); tibia 0·365 (0·106); tarsus 0·289 (0·061) mm.

Material &c.—Of this species I have examined two males and a single female, collected by Dr. Fr. Meinert by sifting at La Moka, in the month of August. This species has been previously mentioned from Paraguay and Brazil.

Remarks.—In minor details, not worth enumerating, my specimens differ from Balzan's description, and also in the very long fingers of the palps in the male, a character not mentioned by Balzan; as the description of the last-mentioned author is not very complete, I do not find any reason to establish a new species. My specimen (female) differs from Ellingsen's description "in the presence of long hairs on the posterior somites" (*cf.* 19. p. 12), in the femur, which is of almost equal breadth throughout, and in the hand, which is only a little wider than the tibia and longer than the finger (*cf.* 19. p. 13).

The male is easily distinguished from all other species of this group by the peculiar structure of the abdominal tergites. The female is distinguished from *Ch. longichelifer* Balz. by the less slender femur of the palps as well as by the more elongated shape of the other joints, but especially by the rather long, distinctly clavate hairs.

10. Chelifer satanas, sp. n. (Plate XXIX. figs. 8 *a–c*; text-fig. 66.)

Cephalothorax.—Rather indistinct *ocular* spots present. The cephalothorax is much longer than wide behind and gradually attenuated towards the front. The *transverse grooves* are very deep and prominent; the deeper posterior one is almost straight, while the anterior is laterally bent outwards and directed forwards. Skin distinctly and coarsely granular everywhere and provided with short distinctly clavate hairs. The second tergite is gradually raised towards its posterior serrated margin.

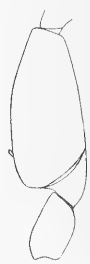
Abdomen.—The abdomen is short and clumsy, almost obovate in shape, far from twice as long as broad; the sclerites increase in length as well as in breadth towards the sixth one. All the tergites are divided by a longitudinal line, which is rather indistinct in the first ones, but becomes more and more prominent behind. The first seven tergites show traces of lateral keels and the first eight have the posterior margin irregularly undulated and serrated. The sclerites are markedly granular all over and bear rather short clavate hairs along the posterior margin in number from 10–12; the V.–X. tergites possess in addition to these, six hairs in front of the row, placed within prominent white spots; the XI. tergite has a pair of very long slender "tactile" hairs.

Sternites without longitudinal line; the VI.–IX. sternites have a greater or lesser part of the sclerites pale; this pale area has the anterior margin convex, and possesses in the first-mentioned sternite only a few spines, but in the last two a large number (about 80) of rather long spines standing close together. The last sternite bears two pairs of "tactile" hairs, and the last but one a single pair only.

Antennæ.—The terminal hair extends perhaps in a slight degree beyond the acute *galea*, which possesses a few obsolete terminal teeth.

Palps (Pl. XXIX. figs. 8 *a–b*).—The maxillæ are granular laterally and in front, but behind are almost smooth in the middle; the palps are distinctly granular above with the exception of the hand; underneath the granulation is less developed and even wanting in the hand, which has its lower surface, like the fingers, smooth all over. All the joints except the fingers are provided with short or very short, more or less distinctly clavate hairs. The *trochanter*, which has a fairly long and well-defined stalk, is 1·9 as long as wide; the anterior surface is moderately and regularly convex, while the posterior has the ventral margin just beyond the stalk produced into a fairly long and rounded conical eminence (fig. 8 *b*), but dorsally it is only slightly produced. The *femur*, which has a fairly short, well-limited stalk, is scarcely widened out towards the end and is broadest in the middle. It is about 3·5 as long as wide; anteriorly beyond the stalk as well as distally it is slightly concave, but a trifle convex or even obtuse-angled between, while posteriorly it is slightly convex basally and then almost straight but for a slightly marked terminal convexity. The *tibia*, which is distinctly shorter and wider than the femur, has a long well-defined stalk and is almost 2·5 as long as wide; anterior outline is distinctly produced in the middle, with the margin almost straight behind the protuberance thus formed, but slightly concave beyond, while the posterior outline beyond the slightly pronounced basal elevation is first straight and then moderately convex. The *chela* is three times as long as wide; the *hand*, which is distinctly narrower than the length of the trochanter, is 1·1 shorter and 1·5 wider than the tibia, it is 1·5 as long as wide, distinctly wider than deep, and scarcely as long as the fingers, which gape moderately when closed; the lateral outlines of the hand are distinctly convex. Both fingers have teeth on the margin from near the base to the tip, those of the immovable finger being the better developed; the immovable finger has anteriorly a single "*spot*" behind the median tactile hair, and the movable one has either a single spot or two apart from each other in the middle.

Text-fig. 66.



Ch. satanas, sp. n., ♂. Femur of left leg IV. in anterior view. × 57.

Coxæ (Pl. XXIX. fig. 8 *c*).—The second and the third pair are scarcely different from the corresponding pairs of the preceding species (*cf.* p. 243); the fourth pair are less slender, have the interior margin longer and better marked, and are almost straight behind, with the postero-exterior corner only slightly produced.

Legs (text-fig. 66).—The proximal joints are granular. The hairs of the dorsal surface of the fourth pair of legs are exceedingly short, at least on the basal joints, and more or less strongly clavate; those of the first pair are somewhat longer and less distinctly clavate; the hairs of the ventral side are generally pointed and more or less simple; the trochanter and trochantins with the usual "tactile" hairs. The tarsal "*tactile*" hair is about $\frac{2}{3}$ removed from the base. The trochantin and the femur proper of the first pair of legs are of almost equal depth and the articulation between them is of the usual structure (*cf.* figs. 7 *g–h*); the tibia is scarcely 1·1 as long as the *tarsus*, which is 4·2 longer than deep; the *femur* of the fourth pair of legs, which is very abruptly raised beyond the stalk and slightly attenuated towards the end, is 2·2 as long as deep, 1·2 as long as tibia, and 1·3 lower than tarsus long. When the animal is observed from above, the legs are easily seen to be thicker and more powerful than in the preceding species.

Colour.—Palps yellowish brown with darker chelæ; cephalothorax, and more especially the abdomen, darker brown.

Measurements.—Cephalothorax 0·782 (0·529); abdomen 1·035 (0·690) mm.

Palps: trochanter 0·322 (0·175); femur 0·598 (0·175); tibia 0·506 (0·215); hand 0·437 (0·285), depth 0·253; finger 0·450 mm.

Leg I.: femur 0·364 (0·152), trochantin 0·076 (0·152); tibia 0·289 (0·099); tarsus 0·274 (0·065) mm.

Leg IV.: femur 0·517 (0·236); tibia 0·418 (0·129); tarsus 0·304 (0·071) mm.

Material.—Of this curious diabolical-looking little species Dr. Fr. Meinert collected a single male at Los Trinchéras in the month of December.

Remarks.—This species is nearly related to *Ch. segmentidentatus* Balz., but is easily distinguished by the structure of the trochanteral part.

11. Chelifer insignis, sp. n. (Plate XXIX. figs. 9 *a–e.*)

Female.

Cephalothorax.—Two prominent real *eyes* are present. Cephalothorax is distinctly longer than wide, and provided with two almost straight transverse grooves, of which the anterior is the more prominent. Skin distinctly granular everywhere, with a number of short clavate hairs.

Abdomen.—Abdomen, which in the specimen examined is dilated with eggs, is twice as long as broad and of a fairly slender appearance. All the tergites, with the exception of the eleventh, are longitudinally divided by a rather indistinct line, similarly to the second tergite. Sclerites provided with scale-shaped granules. The hairs, which are slightly clavate, increase in length towards the end of the abdomen from short to fairly long; their number and arrangement are very curious. The first two tergites, which are rather short, possess only a transverse row along the hindmost margin consisting of about 14 hairs. The following segments have generally in the hindmost row from 10 to 14 hairs, the greatest number being in the median tergites, in addition to 2 lateral hairs and 6 median, placed within pale spots, in front of the row; exceptions which may be mentioned are that the third tergite has no median hair in front of the row and that the ninth and tenth tergites have on each side two hairs in front of the row laterally, the posterior of these two hairs corresponding to the exterior in the hindmost transverse row of the preceding segments, which has changed its position in correlation with the different shape of the sclerites. Of course the position of the above-mentioned hairs is not always the same on the right and on the left side, and it is not always easy to tell to which category a hair is to be referred. The eleventh tergite bears probably a pair of "tactile" hairs.

Antennæ.—The very long and slender cylindrical *galea*, which has about six short terminal branches, is almost twice as long as the terminal hair.

Palps (Pl. XXIX. figs. 9 *a–c*).—The *maxillæ* are almost smooth in the middle, but granular laterally and in front; the palps are distinctly granular, especially above, with the exception of the fingers, which are smooth, and the hand, which is indistinctly granular above and almost smooth beneath. The hairs are short; those of the trochanter and femur are slightly clavate, while most of those on the tibia and hand are obtuse. The *trochanter*, which has a rather short and well-defined stalk, is about 1·5 as long as wide; the anterior outline is moderately convex, while the posterior surface is ventrally slightly produced just beyond the stalk but dorsally produced into a rather deep, rounded, conical protuberance. The *femur*, which has a short fairly well-defined stalk beyond the middle, where it is widest, is somewhat attenuated towards the end, and is 2·6 as long as wide; anteriorly beyond the stalk it is almost straight, while posteriorly beyond the stalk it is first rather abruptly convex and then very slightly so. The *tibia*, which is of almost equal length to, and somewhat wider than, the femur, has a short and fairly well-defined stalk and is 2·2 as long as wide; the anterior outline beyond the stalk is moderately convex, while the posterior beyond the slightly marked condylus and almost obsolete basal elevation is first straight and then terminally slightly convex. The *chela* is almost three times as long as wide; the hand, which is a little broader than the trochanter is long, is 1·1 shorter but 1·3 wider than the tibia; it is 1·6 as long as wide, somewhat wider than deep, and 1·3 as long as the fingers; the lateral outlines of the hand are only moderately convex. The fingers possess "spots" anteriorly as well as posteriorly, the number and arrangement of which have been figured (figs. 9 *b–c*).

Coxæ.—The fourth pair, which are somewhat widened out towards the end, have the interior margin, which is half as long as the posterior, fairly well defined from the latter, which is almost straight.

Legs.—The proximal joints are very indistinctly granular; dorsally the hairs are short and slightly clavate or obtuse, while ventrally they are pointed and more or less simple; the trochanters and trochantins have the usual "tactile" hairs on the ventral surface. A tarsal "*tactile*" hair seems to be present, $\frac{2}{3}$ removed from the base. The *trochantin* of the first pair of legs is only a little deeper than the femur proper and the articulation is of the usual structure (*cf.* above); the tibia is only a trifle shorter than the *tarsus*, which is 4·5 as long as deep. The *femur* of the fourth pair of legs, which is gradually raised beyond the stalk, is 2·5 as long as wide, 1·1 as long as tibia, and 1·6 lower than tarsus is long. The legs are, as a whole, moderately long and slender.

Colour.—Cephalothorax and palps different shades of reddish brown; the tergal sclerites light brown.

Measurements.—Cephalothorax 0·736 (0·667); abdomen 3·00 (1·518) mm.

Palps: trochanter 0·345 (0·240); femur 0·655 (0·253); tibia 0·667 (0·299); hand 0·598 (0·365), depth 0·345; finger 0·460 mm.

Leg I.: femur 0·441 (0·152), trochantin 0·114 (0·160); tibia 0·327 (0·099); tarsus 0·312 (0·067) mm.

Leg IV.: femur 0·570 (0·228); tibia 0·505 (0·122); tarsus 0·372 (0·079) mm.

Variation.—This species is probably identical with a much smaller mutilated female collected by Reinhardt in Lagoa Santa (Brazil), the main differences being size, smaller number of "spots" on the fingers, and longer and more slender legs, having the femur IV. 2·7 instead of 2·5 as long as deep and 1·8 for 1·6 lower than tarsus. The number of "spots" anteriorly is 2 in the immovable and none in the movable finger, and posteriorly 3 and 1 respectively (*cf.* figs. 9 *d–e*).

Material.—A single female from Contiroguita collected by Mr. Hygom.

Remarks.—I was at first inclined to refer this species to *Ch. exilimanus* Balz. (10. pp. 426–427, tav. xiv. figs. 11–11 *b*), the description of which is not very exhaustive, but, on fuller consideration, I think the differences too important to be explained. *Ch. exilimanus* Balz. differs from the above-described species in the smaller number of hairs in front of the row on the abdominal tergites, in the femur of the palps, which is provided with a prominent basal "apophysis" anteriorly, and in the hand, which is only 1·1 broader than tibia and about 1·7 as long as finger.

This species, of which I am sorry not to have had any male at my disposal, is, on account of the structure of the articulation between the trochantin and the distal femoral part of the first pair of legs, naturally referred to the *Ch. subruber* Sim. group. From the other species it may easily be distinguished by the large number of hairs in front of the row on the abdominal tergites, by the comparatively robust femur, and by the narrow hand, which is distinctly longer than the finger.

12. Chelifer exilimanus Balz.

1890. Balzan, (10) pp. 426–427, tav. xiv. figs. 11–11 *b*.
1891. Balzan, (11) p. 549.

The abdominal tergites have not more than six slightly clavate hairs in front of the row. The *femur*, which has a basal apophysis anteriorly, is 2·7 as long as wide; the *tibia* is 2·5 as long as wide and as long as the *hand*, which is only 1·1 as wide as this joint and 1·7 as long as the finger.—Paraguay.

On account of the structure of the flagellum and galea I refer this species without hesitation to the *Ch. subruber* Sim. group.

III. Group of CHELIFER CIMICOIDES F.

Femur of the first pair of legs with wide oblique articular cavity, with posterior condylus placed near ventral margin. Fingers of the palps with accessory teeth. Indistinct eyes or ocular spots. Tarsal "tactile" hair at least $\frac{1}{5}$ removed from base.

This group, as is easily realised when the above meagre diagnosis is compared with those of the preceding groups, is not so well defined as the three others, and I am not quite sure that all the species referred to it really go naturally together; but, as several species could not be examined, and as I had no opportunity of examining and comparing the male genital organs, I have accepted the above definition, as at least one structure, viz. that of the accessory teeth on the fingers of the palps, is characteristic of all the members of this group. The genital apparatus of the male viewed from the outside shows a marked difference when, for instance, *Ch. bicolor* Balz. and *Ch. argentinus* Thor. are compared; but only a closer investigation will show whether these organs are fundamentally different. I have subdivided this group into four subgroups, namely, the *Ch. rudis* Balz. s.-g., *Ch. subrobustus* Balz. s.-g., *Ch. bicolor* Balz. s.-g., and *Ch. argentinus* Thor. s.-g. The last-mentioned of these four divisions is quite a natural one and easily distinguished by a number of characters, and the first and the second are fairly well characterised, but the third is of a rather heterogeneous nature. For practical reasons I have included all the species referred to the first three subgroups in a single analytical key. The *Ch. cimicoides* F. group includes (*cf.* 20. pp. 133–134) most species recorded in the literature as *Chernes* Menge or *Trachychernes* Töm., and a good many of those described as *Lamprochernes* Töm. or *Atemnus* Can. from South America at least.

Synopsis of Species.*

a. Hand with strong protuberances . . . . 18. *Ch. armiger* Balz.
b. Hand without protuberances.
  a^1. Fingers of palps 1·5 as long as hand; palps with partly very long, clavate hairs . . . . 19. *Ch. echinatus* Ell.
  b^1. Fingers about as long as or shorter than hand.
    a^2. About 30 short, distinctly clavate hairs along the hindmost margin of the tergites in addition to 8–10 in front of row. Femur, which is about 1·9 as long as wide, is widened out beyond the stalk anteriorly as well as posteriorly . . . 13. *Ch. rudis* Balz.

* Alb. Tullgren has recently described three species, which probably ought to be referred to the subgroup of *Ch. bicolor* Balz., viz. *Ch. compressus* Tullgr. (23. 1907, pp. 42–43, figs. 8 *a–b*), from Haiti, with a chela which is depressed from above downwards and appears triangular in dorsal view; *Ch. bocki* Tullgr. (23. pp. 44–46, figs. 9 *a–b*), from Bolivia, which, by its fairly long and slender palps with a long tibial stalk, shows a similarity to *Ch. venezuelanus* Balz.; and *Ch. ohausi* Tullgr. (23. pp. 72–73), from Ecuador. To the subgroup of *Ch. bicolor* Balz. probably belongs *Ch. morensis* Tullgr. (24. 1908, pp. 60–63, figs. 4–6), from Argentine, and *Ch. nordenskjöldi* Tullgr. (24. 1908, pp. 63–64, figs. 7–8), from Patagonia, both perhaps nearly related to *Ch. patagonicus* Tullgr.

b^2. Not more than about 20 hairs along hindmost margin and not more than 6 in front of the row.

a^3. Hairs of the hand of plumose appearance. Femur 2·3 as long as wide; chela 2·4 as long as wide, and hand 1·5 as long as finger . . . . 29. *Ch. plumosus*, sp. n.

b^3. Hairs of the hand not plumose.

a^4. Cephalothorax without transverse grooves. Chela slender, at least 3 as long as wide; hand about 1·1 as long as tibia or longer and scarcely wider than the trochanter is long.

a^5. Hand 1·5 as long as tibia. Cephalothorax smooth . 15. *Ch. gracilis* Ell.

b^5. Hand 1·2 or less as long as tibia. Cephalothorax granular.

a^6. Femur rather slender, 2·7 as long as wide, and tibia 2·3 as long as wide. Chela is 3 as long as wide, and hand, which is 1·4 as wide as tibia, is 1·6 as long as finger . . . . 16. *Ch. robustus* Balz.

b^6. Femur only 2·2 and tibia 2·1 or less as long as wide.

a^7. Chela 3 as long as wide; tibia scarcely 2 as long as wide, and hand almost 1·3 as wide as tibia. Granulation indistinct . . . . . . 17. *Ch. subrobustus* Balz.

b^7. Chela 3·5 as long as wide; tibia 2·1 as long as wide, and hand scarcely 1·2 as wide as tibia. Granulation distinct . . . . 14. *Ch. subgracilis*, sp. n.

b^4. Cephalothorax with a single or with two transverse grooves.

a^8. Chela 3·5 as long as wide, and femur 2·2 as long as wide, with small sudden convexity anteriorly. Hand 1·2 as long as tibia, 1·1 as wide, and 1·2 wider than deep . . . . 14. *Ch. subgracilis*, sp. n.

b^8. Chela 3 or less as long as wide; hand 1·1 or less than tibia is long.

a^9. The chela is about 3 as long as wide, and femur from 2·6–3 as long as wide.

a^{10}. Distinctly clavate hairs on palps and abdomen.

a^{11}. Real eyes. Moderately clavate hairs . . . 21. *Ch. germainii* Balz.

b^{11}. Ocular spots. Strongly clavate hairs . . . 20. *Ch. foliosus* Balz.

b^{10}. More or less obtuse hairs on palps and abdomen.

a^{12}. Hand 1·3 as long as finger and narrower than trochanter . . . . 35. *Ch. ellingsenii*, n. sp.

b^{12}. Hand as long as finger and much wider than the trochanter is long . . . . 34. *Ch. patagonicus* Tullgr.

b^9. If the chela is 3 as long as wide, the femur is 2·2 as long as wide.

a^{13}. Abdominal tergites with only 8 hairs along hindmost margin and 2 (lateral) in front of row. The chela is 3 as long as wide; femur 2·2 as long as wide; almost smooth hand 1·1 as deep as wide and 1·2 as long as finger . . . . 30. *Ch. nitidimanus* Ell.

b^{13}. Abdominal tergites with more than 8 hairs along hindmost margin and generally 4 in front of row. Hand more or less distinctly granular.

a^{14}. Femur with long strongly clavate hairs anteriorly. Hand wider than deep.

a^{15}. Palps indistinctly granular. Femur, which is 2·3 as long as wide, is posteriorly beyond stalk almost straight. Cephalothorax and abdomen unicolor. Small species . . . . 22. *Ch. antillarum*, sp. n.

b^{15}. Palps coarsely granular. Femur, which is 2·7 as long as wide, is posteriorly in middle somewhat concave. Second thoracic tergite and abdomen with white spots. . . . . 25. *Ch. albomaculatus* Balz.

b^{14}. Femur with obtuse or moderately clavate hairs anteriorly.

a^{16}. Fingers shorter than hand deep.

a^{17}. Second thoracic and abdominal tergites without white spots. Cephalothorax with single transverse groove . . . . 23. *Ch. subrudis* Balz.

b^{17}. Second thoracic and abdominal tergites with white spots. Cephalothorax with two transverse grooves . . . . . . 24. *Ch. bicolor* Balz.

b^{16}. Fingers distinctly longer than hand deep.

a^{18}. Femur about 2·5 as long as wide; hand about 1·2 as long as finger; femur at least anteriorly distinctly granular. Two transverse grooves.

a^{19}. Palps coarsely granular all over, with moderately clavate hairs; hand at least as deep as wide. Second thoracic tergite with dark or white spot.

a^{20}. Femur 2·5 as long as wide, tibia 2·2, and chela 2·8. Second thoracic tergite with dark median spot . . 26. *Ch. crassimanus* Balz.

b^{20}. Femur 2·4 as long as wide, tibia 2, and chela 2·5. Second thoracic tergite with two lateral white spots	27. *Ch. meinertii*, n. sp.
b^{19}. Palps only distinctly granular laterally, with obtuse hairs; hand wider than deep. Second thoracic tergite unicolor	31. *Ch. michaelseni* Sim.
b^{18}. Femur 2·2 as long as wide; palps indistinctly granular and hairs obtuse.	
a^{21}. Femur not attenuated and minutely granular; tibia 2 as long as wide; chela is 2·7 as long as wide, and hand 1·4 as long as finger. Femur IV. 2·5 as long as deep	28. *Ch. subrotundatus* Balz.
b^{21}. Femur attenuated and almost smooth; tibia 2·2 as long as wide; chela 3 as long as wide and hand 1·1 as long as finger. Femur IV. 3·2 as long as deep.	
a^{22}. Single transverse groove	33. *Ch. celerrimus*, sp. n.
b^{22}. Two transverse grooves	32. *Ch. brevifemoratus* Balz.

a. Subgroup of CHELIFER RUDIS Balz.

Flagellum consists of four hairs. Sexual difference observed in galea. 30 *short clavate hairs along hindmost margin of tergites and* 8–10 *in front. Proximal joints of palps short and clumsy and chela long and slender.*

Only a single species known, to the description of which I refer.

13. CHELIFER RUDIS Balz. (Plate XXX. figs. 10 *a–f.*)

1890. Balzan, (10) pp. 423–424, tav. xiv. figs. 9–9 *c.*
1891. Balzan, (11) p. 548.

Male.

Cephalothorax (*cf.* Pl. XXX. fig. 10 *c*).—At a distance from the front margin at least equal to their diameter, are two white *ocular* spots; they are of moderate size and as a whole not well separated from the surrounding parts of the integument, even showing traces of granulation; on account of these features they are designated ocular spots, though they are similar to real eyes in the anterior part, which, at least on the left, is somewhat arched and prominent like a true lens. The cephalothorax, which is much wider behind than it is long, tapers gradually towards the eyes, but becomes rather suddenly attenuated in front. Two rather indistinct transverse *sutures*, of which the posterior is straight, while the anterior appears slightly curved backwards in the middle, are present; the second tergite is longitudinally divided similarly to the abdominal ones. The cephalothorax is distinctly *granular* all over, or, more correctly, is covered with a mosaic of small rounded plates at least on the head and first tergite. A large number (about 100) very short, distinctly clavate *hairs* are found, of which four somewhat longer are placed along the front margin and about 20 along the hinder margin of the cephalothorax.

Abdomen.—The abdomen is broad and flattened and has all the tergites longitudinally divided; the sclerites are minutely *granular*, and bear a very large number of rather short distinctly clavate *hairs* along the hindmost margin, viz. about 20 in the first segments, 30 in the median, and 24 in the tenth; in addition to these the median and posterior segments possess two lateral hairs in front of the row and three more median hairs in each half, the number varying somewhat, as it is not always easy to realise the position of a hair. No "tactile" hairs seem to be present on the eleventh segment. The *genital* area is not very conspicuous; the anterior plate is granular, with a number of hairs, of almost equal length to those of the posterior plate, with many hairs in front.

Antennæ.—The terminal hair extends very much beyond the short and clumsy attenuated *galea*, which shows traces of a few terminal teeth (*cf.* Balzan, 10. fig. 9 *c*). The *flagellum* in the examined specimen consisted of only two long hairs, of which the anterior was marginally serrated, but it was probably imperfect.

Palps (*cf.* Pl. XXX. figs. 10 *a–b, d–e*).—The *maxillæ*, which, as shown in the figure, are almost triangular, are almost smooth. The palps show a mosaic of small plates similar to the cephalothorax, which is, however, rather indistinct beneath and on the hand and is completely wanting in the fingers. Numerous very short *hairs* are found, which vary in form from distinctly clavate on the trochanter to very slightly clavate on the hand. The *trochanter*, which has a very short, well-defined stalk, is 1·3 as long as wide; its anterior outline beyond the stalk is almost circular, while ventrally the posterior surface is produced into a short somewhat conical protuberance, and the dorsal into a larger more rounded one, giving a bigibbose appearance. The *femur* has a short, very well-defined stalk, beyond which it is suddenly widened out and then distinctly attenuated towards the end. It is basally much wider than the trochanter and terminally only slightly so, and is 1·9 as long as wide; the anterior outline just beyond the stalk is suddenly produced into a somewhat triangular process, which merges gradually into the almost straight more distal portion; the posterior surface beyond the stalk is very distinctly and almost perpendicularly raised, then almost straight, and at last slightly convex. The *tibia*, which has a rather short, but exceedingly well-marked stalk, is scarcely longer, but distinctly wider than the femur, and is 1·8 as long as broad; the anterior outline is first, just beyond the stalk, strongly convex and then distally almost straight; posteriorly, beyond the basal elevation, which is scarcely marked off distally but basally is separated by a deep notch from the prominent condylus, it is at first almost straight and then slightly convex. The *chela*, which is 2·8 as long as wide, is scarcely 1·2 as broad as the trochanter is long; the *hand*, which is distinctly longer and 1·3 as broad as the tibia, is 1·7 as long as wide, 1·3 broader than deep, and 1·5 as long as the fingers, which gape slightly when closed. Both fingers bear a number of *accessory* teeth distally arranged, as shown in the figures (figs. 10 *a–b*); the immovable finger has 9 posteriorly and 3 anteriorly, while the movable has 11 and 5 respectively. The number of "*spots*" anteriorly on both the movable and immovable fingers is five and the same number is found on both posteriorly; the arrangement of these "spots" is shown in the figures.

Coxæ (*cf.* Pl. XXX. fig. 10 *e*).—The coxæ are very characteristic, being very elongated. The first pair are at least twice as long as broad and of almost equal breadth throughout; the two following pairs are triangular, having the interior side very short and being widened out towards the end. The *fourth pair* again are trapezoidal, being distinctly broader than the third and scarcely enlarged towards the extremity; the interior margin is much shorter than the posterior, slightly concave one and is well separated from it by the obtuse-angled postero-interior corner.

Legs (*cf.* Pl. XXX. fig. 10 *f*).—Proximal joints with scale-shaped granules. The legs bear dorsally short or rather short, more or less distinctly clavate hairs; those of the ventral surface are longer and slightly clavate or pointed; no "*tactile*" hairs observed. The legs are rather short and clumsy; the trochantin of the first pair of legs has a very wide articular cavity and is somewhat deeper than the tibial part; the tibia is 1·2 longer than the *tarsus*, which is only 3·2 as long as deep. The *femur* of the fourth pair of legs is 2·1 as long as deep, 1·1 as long as tibia, and scarcely 1·1 lower than tarsus is long.

Colour.—The palps and the cephalothorax are light brown; the abdominal sclerites are more yellowish brown.

Measurements.—Cephalothorax 1·265 (1·495); abdomen 3·450 (2·300) mm.

Palps: trochanter 0·690 (0·529); femur 1·173 (0·610); tibia 1·196 (0·667); hand 1·380 (0·815), depth 0·635; finger 0·920 mm.

Leg I.: femur 0·745 (0·296), trochantin 0·175 (0·315); tibia 0·532 (0·198); tarsus 0·448 (0·140) mm.

Leg IV.: femur 1·034 (0·502); tibia 0·911 (0·254); tarsus 0·532 (0·178) mm.

Female.

Cephalothorax (Pl. XXX. fig. 10 *c*).—Two real eyes are present of a somewhat peculiar shape, being rather low behind, but well curved and very prominent in front.

Abdomen.—The longitudinal line is very broad in the median segments, decreasing towards the extremities, especially in front.

Antennæ.—The *galea* extends somewhat beyond the terminal hair and seems to bear a few short teeth in the imperfect specimen examined (*cf.* Balzan, 10. fig. 9 *c*, ♀). The *flagellum* consists of four hairs, of which only the anterior has marginal teeth (*cf.* Balzan, fig. 9 *a*).

Palps (Pl. XXX. fig. 10 *d*).—The palps are only slightly different from those of the male in the proportions between the joints. The *femur* is only 1·8 as long as wide, and much more attenuated, terminally being scarcely as wide as the trochanter; the *tibia* is only 1·7 as long as wide and more strongly convex anteriorly; the *chela* is 3 times as long as wide; the hand is only 1·2 wider than the tibia and 1·4 longer than the *fingers*, which do not gape when closed. The number of the *accessory* teeth is the same as in the male and the marginal teeth are much better developed. The number of the "*spots*" is almost the same as in the male, but the arrangement shows a few interesting modifications, the most important being that the immovable finger has a single "spot" anteriorly behind the basal hair, and posteriorly five "spots" close together and a single much larger one, standing more apart, while the movable finger possesses two pairs of spots, one behind the other, and a single spot more apart.

Coxæ (Pl. XXX. fig. 10 *e*).—The fourth pair are less slender and the posterior margin only a little longer than the interior.

Legs (Pl. XXX. fig. 10 *f*).—The legs perhaps less slender, especially the tarsus of the first pair of legs, which is only three times as long as deep.

Colour.—The colour is distinctly darker: dark reddish-brown palps and dark brown cephalothorax and abdominal sclerites.

Measurements.—Cephalothorax and abdomen as in the male.

Palps: trochanter 0·647 (0·506); femur 1·012 (0·575); tibia 1·035 (0·598); hand 1·226 (0·690), depth 0·540; finger 0·897 mm.

Leg I.: femur 0·661 (0·266), trochantin 0·170 (0·289); tibia 0·494 (0·182); tarsus 0·414 (0·137) mm.

Leg IV.: femur 0·950 (0·437); tibia 0·850 (0·220); tarsus 0·502 (0·170) mm.

Material &c.—Of this very interesting species I have only examined two specimens, viz. a female collected by E. v. Benzon in Monte Rita (Brazil?) and a male collected by Dr. W. Sörensen in Argentine (Riacho dell' Oro). Balzan's specimens are from Paraguay, living under the bark of trees.

Remarks.—The species described is certainly identical with Balzan's, in spite of slightly different proportions of the joints of the palps, somewhat smaller size, greater number of hairs in front of the row and in the row on the median tergites; a rather curious difference is found in the flagellum, which has the three posterior hairs simple, not dentated as in Balzan's specimens.

b. Subgroup of CHELIFER SUBROBUSTUS Balz.

Flagellum consists of three hairs. Cephalothorax generally with some ocular spots and without transverse grooves or with a median one. The proximal joints of palps short and clumsy in contradistinction to long and slender chela, which has hand much longer than tibia. Tarsal tactile hair at least a half removed from the base.

With the very scanty material at my disposal it is very difficult to mark this group sharply off from the following, but I am, nevertheless, practically convinced that it is quite a natural one. The shape of the cephalothorax, generally without transverse grooves, the contrast between the slender chela, with hand which is distinctly larger than the finger and much longer than the tibia, and the clumsy femur, together with the elongated coxæ, give these species a peculiar appearance, somewhat similar to that of *Chelifer rudis* Balz.* The three previously known species referred to this group were originally described as belonging to *Atemnus* Can., but I think that the presence of accessory teeth on fingers of palps and the position of the tarsal "tactile" hair, well removed from base, make it necessary to place these species apart from *Ch. nidificator* Balz. &c.

14. CHELIFER SUBGRACILIS, sp. n. (Plate XXX. figs. 11 *a–b*.)

Female.

Cephalothorax.—Two fairly distinct *ocular* spots. The cephalothorax, which is somewhat longer than wide, has the membranous cucullus which covers the base of the antennæ very well developed; only the anterior transverse *groove*, which is slightly curved backwards in the middle and fairly prominent, is found. The integument is minutely, but distinctly granular, except in the hindmost part of the second tergite; the hairs are short and slightly clavate.

Abdomen.—The abdomen, which is not very slender and somewhat depressed, has all the tergites except the hindmost part of the eleventh divided by a wide longitudinal band. The sclerites are indistinctly granular with scale-shaped granules; and the tergites bear from 12–16 generally rather short and slightly clavate *hairs* along the hindmost margin, in addition to two lateral ones distinctly, and two median ones, very indistinctly, in front of the row. A moderately big round spot, covered with numerous short hairs, is observed in front of the vulva. The dorso-ventral integument is beset with densely placed, parallel, undulated, longitudinal ridges.

Antennæ.—The rather slender *galea*, which possesses six short terminal branches, scarcely extends beyond the terminal hair.

Palps (Pl. XXX. figs. 11 *a–b*).—The *maxillæ* are almost smooth in the middle, but granular laterally; the *trochanter*, *femur*, and in a less degree the *tibia*, are distinctly

* Marked differences from this species are, however, found in number of tergal hairs, &c.

granular above and laterally, but almost smooth below, while the hand is partly quite smooth and partly indistinctly granular. The *hairs* of the three proximal joints are short and obtuse, while those of the hand are more simple. The *trochanter*, which is as long as wide, is anteriorly regularly and distinctly convex in the middle and terminates with a slightly marked convexity; posteriorly it is suddenly produced into a rounded protuberance and dorsally into a rather low, somewhat conical protuberance. The *femur* has a very short and well-defined stalk, beyond which it is distinctly attenuated towards the extremity. It is 2·2 as long as wide; both margins are almost straight beyond the stalk, from which the anterior outline is slightly raised, while the posterior is very distinctly and abruptly so. The *tibia*, which has a short and well-defined stalk, is a little longer and wider than the femur, and 2·1 as long as wide; the anterior outline is basally moderately convex and then very slightly concave; the posterior outline beyond the basal elevation, which is separated from the prominent condylus by a deep notch, but which is not limited distally, is first almost straight and then moderately convex. The *chela*, which is about 3·5 as long as wide, is scarcely wider than the trochanter is long; the *hand*, which is at least 1·1 as long as the tibia, but scarcely 1·2 wider, is about twice as long as broad, almost 1·2 as wide as deep, and 1·4 as long as the fingers, which are much longer than hand is wide and do not gape when closed; the exterior outline of the hand just beyond the stalk is very abruptly produced and then becomes almost straight, while the interior is more gradually convex; the dorsal and ventral margins are almost straight. Both fingers bear anteriorly 2 *accessory* teeth near to the tip, while the number posteriorly is much greater, viz. about 8 in the immovable and 5 in the movable finger in the distal half. Anteriorly the immovable finger has only a single "*spot*" placed between the tactile hairs; posteriorly it has a single "spot" placed between the three basal tactile hairs which stand close together, and two just beyond the median tactile hair; while the movable finger has two "spots" at least, placed between the basal and the median tactile hairs, and a single one beneath and in front of the latter.

Coxæ.—The coxæ show perhaps greatest similarity to those of *Ch. rudis* Balz., but differ by their less elongated shape; the second and the third pair are distinctly widened out towards the extremity and are of somewhat triangular appearance, as the inner margins, especially those of the second pair, are short. The *fourth pair*, which are somewhat trapezoidal and scarcely widened out towards the end, have the inner margin, which is about as long as the somewhat concave hinder margin, passing gradually into the latter.

Legs.—The proximal joints are indistinctly granular. The hairs of the dorsal side are short and obtuse or dentated; those of the ventral are longer, pointed, and more or less simple. The tarsal "*tactile*" hair is two-thirds removed from the base and as long as this distance. The legs are fairly long and slender, and have the trochantin of the first pair much deeper than the tibial part, while the tibia is 1·3 longer than the *tarsus*, which is 3·3 as long as deep. The *femur* of the fourth pair of legs is 2·4 as long as deep, 1·2 as long as the tibia, and 1·3 lower than the tarsus is long.

Colour.—The palps are dark reddish brown; the cephalothorax, which has a somewhat lighter hinder margin, is brown and so are the tergal sclerites.

Measurements.—Cephalothorax 1·104 (0·989); abdomen 2·80 (1·73) mm.

Palps: trochanter 0·506 (0·355); femur 0·897 (0·410); tibia 0·910 (0·437); hand 1·035 (0·500), depth 0·414; fingers 0·713 mm.

Leg I.: femur 0·623 (0·217), trochantin 0·114 (0·236); tibia 0·456 (0·137); tarsus 0·342 (0·103) mm.

Leg IV.: femur 0·874 (0·365); tibia 0·707 (0·198); tarsus 0·426 (0·129) mm.

Material.—Of this species I have examined a single female from Brazil mounted together with *Ch. imperator*, sp. n., &c.

This species seems to differ from the three following by the presence of a fairly distinct median transverse groove; it differs besides from *Ch. gracilis* Ell. by the granular cephalothorax, the slightly clavate hairs, and by the hand, which is scarcely 1·1, not 1·5, as long as the tibia; from *Ch. robustus* Balz. by the less slender femur, being 2·2 instead of 2·7 as long as wide, and more slender chela, being 3·5 instead of 3 as long as wide; from *Ch. subrobustus* Balz. by much more clumsy tibia and more slender chela, which is 3·5 instead of scarcely 3 as long as wide and has only a few spots anteriorly on the movable finger.

15. Chelifer gracilis Ell.

1902. Ellingsen, (15) pp. 148–149.

Cephalothorax smooth, without transverse *grooves*, and with short simple hairs. *Femur*, which is distinctly attenuated, is anteriorly proximally slightly convex and then distinctly concave and posteriorly "régulièrement et médiocrement convexe"; *tibia* with strong stalk and "presque régulièrement ovale"; the *hand*, which is somewhat wider and 1·5 as long as the tibia, is 1·5 as long as the finger.—Ecuador.

This species is distinguished from the others of this group by the very long hand.

16. Chelifer robustus Balz.

1890. Balzan, (10) pp. 418–420, tav. xiii. figs. 6–6 *b*.

1891. Balzan, (11) p. 548.

Cephalothorax minutely granular, without transverse *grooves* and with short dentated hairs. The *femur*, which scarcely seems to be attenuated, is 2·7 as long as wide; the *tibia*, which is 2·3 as long as wide, has outlines slightly convex; the *hand*, which is scarcely 1·1 as long as, but 1·4 as wide as, the tibia, is 1·6 as long as the finger; the chela is about 3 as long as wide.—Paraguay and Brazil.

17. CHELIFER SUBROBUSTUS Balz. (Plate XXX. figs. 12 *a–b*.)

1891. *Atemnus subrobustus* Balzan, (11) pp. 512–513, pl. 9, figs. 3–3 *a*.

Cephalothorax.—The cephalothorax, which is about as long as wide, has no transverse grooves, and is minutely, not very distinctly granular.

Abdomen.—The hairs are moderately long, pointed or obtuse.

Antennæ.—The terminal hair extends slightly beyond the rather short and clumsy *galea*, which is exactly like Balzan's figure 3 *a* and with six short branches.

Palps (Pl. XXX. figs. 12 *a–b*).—The *maxillæ* are smooth. The palps are minutely granular, with the exception of the almost smooth chela; the dorsal and lateral surfaces of the trochanter and femur are fairly distinctly granular, while the lower surfaces and the tibia are less distinctly so. The hairs seem to be rather short and slightly obtuse. The *trochanter*, which is about 1·5 as long as wide, is anteriorly strongly convex and posteriorly produced into a rounded protuberance; the low dorsal tubercle is somewhat conical. The *femur* has a very short and well-defined stalk, beyond which it is somewhat attenuated. It is about 2·1 as long as wide; the anterior outline is slightly convex and then concave, while the posterior is abruptly raised and then almost straight. The *tibia*, which has a very short and well-defined stalk, is longer and wider than the femur and scarcely twice as long as broad; anteriorly it is distinctly convex and then a trifle concave, while the posterior outline, beyond the well-marked basal elevation, which is separated by a deep notch from the prominent condylus, is first almost straight and then moderately convex or obtuse-angled. The *chela*, which is about 3 as long as wide, is 1·1 broader than the trochanter is long; the *hand*, which is 1·1 as long as, but 1·3 wider than, the tibia, is almost 1·8 as long as wide, 1·3 broader than deep, and about 1·4 as long as the fingers, which are much (1·3) longer than the hand is wide and gape a trifle when closed; the hand beyond the stalk is very abruptly raised posteriorly, but anteriorly, as well as dorsally and ventrally, more gradually convex, and then almost straight (*cf.* Balzan's good figure 3 of palps, pl. 9). Anteriorly no *accessory* teeth were observed, but posteriorly about 15 in both fingers (figs. 12 *a–b*). The immovable finger bears anteriorly about eight "*spots*" arranged as figured and posteriorly a similar number, while the movable finger has none.

Coxæ.—The second and third pair are longer and more slender than those of *Ch. subgracilis*, sp. n., but less so than those of *Ch. rudis* Balz. The fourth pair are somewhat triangular, as the inner somewhat shorter margin merges into the hinder and as they are widened out towards the extremity.

Legs.—Only the femur of the fourth pair distinctly granular, the other joints smooth or indistinctly so. The hairs of the dorsal side of the legs are short, obtuse, and with a few teeth, while those of the ventral side are long, pointed, and more or less simple. A median tarsal "*tactile*" hair seems to be present. The legs are rather short and clumsy; the trochantin of the first pair is deeper than the tibial part and the tibia is 1·3 as long as the *tarsus*, which is 3·5 as long as deep; the *femur* of the fourth pair of legs is scarcely 2·2 as long as deep, 1·2 as long as the tibia, and 1·1 lower than the tarsus is long.

Colour.—The palps are reddish brown.

Measurements.—Body about 4 mm. long without antennæ.

Palps: trochanter 0·483 (0·335); femur 0·805 (0·380); tibia 0·851 (0·437); hand 0·943 (0·540), depth 0·437; finger 0·690 mm.

Leg I.: femur 0·600 (0·205), trochantin 0·091 (0·215); tibia 0·410 (0·126); tarsus 0·312 (0·091) mm.

Leg IV.; femur 0·798 (0·372); tibia 0·661 (0·182); tarsus 0·410 (0·122) mm.

Material.—Of this species I have examined a single damaged specimen (♀) from New Granada (Keyserling Coll.); the typical specimen is from Venezuela.

Remarks.—That the described specimen belongs to *Ch. subrobustus* Balz., I regard as quite certain, as the differences are only trivial; it differs from *Ch. robustus* Balz. by the less slender femur and tibia and from *Ch. gracilis* Ell. by the granular cephalothorax and less slender hand.

c. Subgroup of Chelifer bicolor Balz.

Flagellum consists of three hairs. Cephalothorax generally with ocular spots and two transverse grooves. The hand seldom much longer than the tibia. The tarsal "tactile" hair is more than one-fourth removed from base.

This group contains species which in many respects differ greatly among themselves. It includes, in fact, all those which cannot be naturally placed in any of the three preceding groups. Nevertheless, several of the species show close relationship to each other: *Ch. bicolor* Balz., *Ch. subrudis* Balz., &c., are nearly related to each other, showing similarity in the structure of the male genital organs, in the shape of the palps, and the colour of the second thoracic tergite; *Ch. patagonicus* Tullgr. and *Ch. ellingsenii*, sp. n., are nearly related to each other as well as to *Ch. elegans* Balz., referred to the following subgroup.

18. Chelifer armiger, Balz.

1891. *Trachychernes armatus* Balzan, (11) pp. 527–528, pl. 10. fig. 18.

Cephalothorax minutely granular, with two transverse *grooves.* Abdomen with long pinnate hairs along hindmost margin and six in front. The *hairs* of palps dentated or pinnate; the *femur* at least 3 as long as wide; *tibia*, which is about 2·5 as long as wide, has moderately convex outlines. *Hand*, which is scarcely longer than finger, of a most remarkable shape, being provided with three conical *protuberances.*—Amazons and Peru.

19. CHELIFER ECHINATUS Ell.

1904. Ellingsen, (16) pp. 2–4.

Cephalothorax strongly granulose, with two strong transverse *grooves*. Abdomen with fairly long strongly clavate *hairs*. Hairs of palps posteriorly short, strongly clavate, anteriorly very long, somewhat thickened; the *femur* is 2·5 as long as wide; the *tibia* with long stalk and strongly convex outlines; *fingers* 1·5 as long as hand, which is 1·5 as wide as tibia.—Patagonia.

20. CHELIFER FOLIOSUS Balz.

1890. Balzan, (10) pp. 427–428, tav. xiv. figs. 12–12 c^{III}.
1891. Balzan, (11) p. 548.

Cephalothorax minutely granular, with two distinct *grooves*. Abdomen with granular sclerites and with clavate *hairs*. *Hairs* of palps long and strongly clavate; the *femur* is about 3 as long as wide; the *tibia*, which is 2·2 as long as wide, has lateral outlines moderately convex. The *hand*, which is distinctly longer and 1·2 wider than the tibia, is about 1·2 as long as fingers.—Paraguay.

21. CHELIFER GERMAINII Balz.

1890. Balzan, (10) pp. 424–426, tav. xiv. figs. 10–10 *c*.
1891. Balzan, (11) p. 548.
1905. Ellingsen, (17) pp. 1–3.

Two distinct *eyes*. Cephalothorax minutely granular, with two *grooves*. Abdomen with granular sclerites and distinctly clavate *hairs*. Palps granular, with distinctly clavate hairs; the *femur* is 3·1 as long as wide; the *tibia*, which is 2·4 as long as wide, has lateral outlines moderately convex. The *hand*, which is somewhat longer and 1·4 wider than tibia, is 1·2 as long as finger. The second thoracic tergite is, according to Ellingsen, whitish with a dark spot in middle.—Matto Grosso and Ecuador.

Balzan and Ellingsen refer this species to their subgenus *Chelifer*; on account of the structure of flagellum, galea, and colour, I think it is most naturally placed in this group in spite of real (?) eyes. Until the structure of fingers and legs has been studied, the question cannot be settled definitively.

22. CHELIFER ANTILLARUM, sp. n. (Plate XXX. figs. 13 *a–b*.)

Cephalothorax.—The *ocular* spots are very indistinct. The cephalothorax, which is somewhat longer than wide, has the anterior almost straight transverse *line* fairly distinct, in contradistinction to the slightly concave, almost obsolete, posterior one. The integument is distinctly granular, at least in front, and bears rather short, distinctly clavate hairs.

Abdomen.—The long and slender abdomen has apparently all the tergites, except part of the eleventh, longitudinally divided. The sclerites have rather indistinct scale-shaped *granulations*, and the tergites bear along their hinder margin 8–10 more or less long and slender distinctly clavate *hairs*, in addition to two lateral hairs distinctly in front of row and two median indistinctly so. The eleventh sternite has a pair of rather short "tactile" hairs; similar ones probably found on corresponding tergite.

Antennæ.—The fairly slender *galea*, which has about six terminal teeth, extends slightly beyond the terminal hair.

Palps (Pl. XXX. figs. 13 *a–b*).—The *maxillæ* are almost smooth. The palps are indistinctly granular and striated above, below smooth but not polished. The hairs, which vary much in length, are more or less strongly clavate, at least in the three proximal joints, and basally in the hand, with the exception of a few which are only dentated; the clavate ones of the hand pass gradually into the pointed and more or less simple ones of the fingers. The *trochanter*, which is 1·4 as long as wide, is moderately convex anteriorly and slightly produced posteriorly; dorsally it is prolonged into a fairly high, somewhat rounded protuberance. The *femur* has a short and well-defined stalk, beyond which it tapers towards the extremity. It is 2·3 as long as wide; anteriorly it is just beyond the base a trifle produced and then almost straight, and posteriorly the outline beyond the rather abrupt basal convexity is almost straight and then slightly convex. The *tibia*, which has a short not very well-defined stalk, is as long as and a little wider than the femur, and just twice as long as broad; the anterior outline beyond the stalk is rather abruptly and strongly convex and then in a slight degree concave, but the posterior beyond the very small condylus is almost straight and then moderately convex. The *chela*, which is 2·6 as long as wide, is about 1·1 as broad as the trochanter is long; the *hand*, which is scarcely as long as the tibia, but 1·3 broader, is 1·5 as long as wide, almost 1·1 as wide as deep, and 1·3 as long as fingers, which are somewhat longer than the hand is wide and which do not gape when closed; the lateral and the dorsal outlines are moderately convex, while the ventral is only slightly so. Anteriorly the immovable finger has a single *accessory* tooth distinctly beyond the middle; posteriorly both fingers possess a single distal tooth (fig. 13 *b*). Anteriorly the immovable finger has the median tactile hairs placed the one above the other, and somewhat behind the lower there is a large "*spot*"; posteriorly both fingers have three spots, arranged as shown in figure.

Coxæ.—The fourth pair are trapezoidal, only in a slight degree widened out towards the end, much longer than broad, and have the interior margin shorter than and fairly well separated from the posterior.

Legs.—The proximal joints are smooth. The long hairs are dorsally in the fourth pair of legs strongly clavate and slightly curved, and in the first pair only slightly convex; the ventral hairs are pointed and more or less simple. The tarsal "*tactile*" hair a little more than two-thirds removed from the base and as long as the distance to the tip. The legs are short and clumsy, and the *trochantin* of the first pair of legs is scarcely deeper than the femur proper, while the tibia is a trifle longer than the *tarsus*, which is 3·6 as long as deep; the *femur* of the fourth pair of legs is 2·5 as long as deep, 1·2 as long as the tibia, and 1·7 lower than tarsus long.

Colour.—The palps are reddish brown; the cephalothorax and abdominal sclerites are yellowish brown.

Measurements.—Cephalothorax 0·483 (0·437); abdomen 1·380 (0·782) mm.

Palps: trochanter 0·230 (0·161); femur 0·414 (0·175); tibia 0·414 (0·207); hand 0·407 (0·265), depth 0·245; finger 0·299 mm.

Leg I.: femur 0·274 (0·099), trochantin 0·061 (0·099); tibia 0·198 (0·072); tarsus 0·190 (0·053) mm.

Leg IV.: femur 0·319 (0·129); tibia 0·266 (0·076); tarsus 0·220 (0·065) mm.

Material.—Of this species I have examined a single female, infected with black round bodies, perhaps spores of fungi: collected in St. Vincent by E. Simon.

Remarks.—This species, which is well characterised by its small size, the long, strongly clavate hairs of the palps, and the short distinctly convex tibia, appears to be similar to *Ch. foliosus* Balz., which, however, has the palps much more slender, the femur being, for instance, almost three times as long as wide and of almost double the size.

23. Chelifer subrudis Balz. (Plate XXX. figs. 14 *a–f.*)

1891. *Trachychernes subrudis* Balzan, (11) pp. 321–322, pl. 10. figs. 13–13 *b*.

Male.

Cephalothorax.—Small distinct *ocular* spots are present. The cephalothorax, which is much longer than wide, has a median fairly distinct transverse *groove* slightly curved backwards in the middle, and shows a trace of a hindmost one. The integument is minutely granular, and the hairs are short and obtuse.

Abdomen.—The long slender abdomen is almost three times as long as wide and has all the tergites, with the exception of the first and the eleventh, longitudinally divided. The sclerites are distinctly granular and with from 10–14 fairly long and slightly clavate or obtuse *hairs* along the hindmost margins as well as generally four hairs in front of the row. The eleventh tergite has a pair of "tactile" hairs. The *genital* area has a long anterior and a short posterior plate, with a wide transverse split between.

Antennæ (*cf.* Pl. XXX. fig. 14 *a*).—The terminal hair extends in a slight degree beyond the rather short and clumsy *galea*, which has six short distal branches. The *flagellum* consists of three hairs, of which the anterior has several marginal teeth and the two behind a few only (fig. 14 *a*).

Palps (*cf.* Pl. XXX. figs. 14 *b–c*).—The *maxillæ* are smooth and glossy; the palps are minutely and not very distinctly granular above, below very indistinctly; the short *hairs* are obtuse or dentated. The *trochanter*, which is 1·5 as long as wide, is anteriorly moderately convex and posteriorly very slightly produced; dorsally it is very slightly raised (in contradistinction to Balzan's description, but similar to his fig. 13). The *femur* has an extremely short stalk, beyond which it is distinctly widened out to a point somewhat behind the tip. It is twice as long as wide; the anterior outline is at first very slightly convex and then distally concave, while the posterior and especially the dorsal outlines (on account of the very short and clumsy shape it is very difficult sharply to distinguish between these two margins) are at first rather abruptly convex, then very slightly concave, passing again finally into a slight convexity. The *tibia*, which has a short well-marked stalk, is somewhat longer and broader than the femur, and scarcely twice as long as broad; it is much deeper than wide; the anterior outline, beyond the stalk, is abruptly convex, almost protuberant, and then almost straight; the posterior outline, beyond the fairly prominent condylus and slightly marked basal elevation, is at first for a short distance almost straight and then slightly convex; the dorsal outline is slightly produced and the ventral is moderately convex. The *chela*, which is 2·7 as long as wide, is scarcely 1·1 as broad as trochanter is long; the *hand*, which is about as long as but 1·3 wider than the tibia, is 1·5 as long as wide, but only 1·1 as long as deep, almost 1·4 deeper than wide, and 1·2 as long as fingers, which are 1·1 shorter than hand deep and do not gape when closed; the lateral outlines of the hand as well as the ventral are gradually and moderately convex, while the dorsal outline just beyond the stalk is very high and very steep, even slightly inclining backwards and then slightly convex. The fingers bear anteriorly a few *accessory* teeth distally, and posteriorly a number from the middle to the tip; the number and arrangement of "*spots*" could not be investigated on account of the black colour of the chela.

Coxæ.—The second and the third pair are slightly enlarged, the former being very slightly narrowed basally. The fourth pair are quadrangular in shape, slightly widened out, and with the inner margin somewhat shorter than the slightly concave hinder, not well limited from it.

Legs (*cf.* Pl. XXX. figs. 14 *e–f*).—The proximal joints are very indistinctly granular only. The fairly long hairs are dorsally dentated and obtuse (sometimes slightly clavate), but ventrally pointed and more or less clumsy; a short tarsal "*tactile*" (?) hair, scarcely three-fourths removed from base and a little longer than its distance to the tip. The legs are very short and clumsy; the tibial part of the femur of the first pair of legs is a little deeper than the trochantin, and the tibia is distinctly (1·1) longer than the *tarsus*, which is scarcely 3 as long as deep. The *femur* of the fourth pair of legs is 2·2 as long as deep, 1·3 as long as the tibia, and 1·2 lower than the tarsus is long.

Colour.—The palps are dark brown, and so is the cephalothorax, while the abdominal sclerites, placed within white skin, are light brown.

Measurements.—Cephalothorax 0·851 (0·690); abdomen 3·100 (1·035) mm.

Palps: trochanter 0·460 (0·322); femur 0·713 (0·368); tibia 0·736 (0·391); hand, 0·759 (0·506), depth 0·690; finger 0·621 mm.

Leg I: femur 0·502 (0·220), trochantin 0·091 (0·213); tibia 0·357 (0·157); tarsus 0·327 (0·114) mm.

Leg IV.: femur 0·737 (0·334); tibia 0·578 (0·198); tarsus 0·410 (0·144) mm.

Female.

Antennæ (Pl. XXX. fig. 14 *a*).—The *galea* is a little longer and extends in a slight degree beyond the terminal hair.

Palps (Pl. XXX. figs. 14 *b–c*).—The palps are only in a very slight degree different; the ventral outline of the *tibia* is slightly and the dorsal fairly distinctly produced (fig. 14 *c*); the *hand* is only 1·4 as long as wide and scarcely 1·1 as long as deep, scarcely 1·3 deeper than wide. Of "*spots*" at least three are found at the base of the movable finger anteriorly.

Coxæ (Pl. XXX. fig. 14 *d*).—The fourth pair are distinctly different from the corresponding pair of the male, being as wide basally as terminally, and with the inner margin separated from the hinder by a distinct obtuse angle and much longer; the whole coxa trapezoidal.

Legs (Pl. XXX. figs. 14 *e–f*).—The legs are perhaps a trifle less slender.

Colour.—Body and palps a little lighter.

Measurements.—Cephalothorax 0·989 (0·805); abdomen 4·25 (1·75) mm.

Palps: trochanter 0·506 (0·345); femur 0·782 (0·391); tibia 0·805 (0·414); hand 0·828 (0·598), depth 0·782; finger 0·690 mm.

Leg I.: femur 0·532 (0·236), trochantin 0·099 (0·228); tibia 0·380 (0·167); tarsus 0·350 (0·122) mm.

Leg IV.: femur 0·810 (0·368); tibia 0·616 (0·220); tarsus 0·433 (0·160) mm.

Material &c.—Of this species I have examined a female collected in Caracas by Mr. Stroll and a male collected at Los Tejas (Caracas) by Dr. Meinert. Balzan's specimen is from Venezuela.

Remarks.—The insignificant differences found between Balzan's description and my specimens are scarcely worth recording, except that he writes "Digiti . . . manu multo breviores." This species may easily be distinguished from all other species known to me by the curious palps, especially the excessively deep chela. In these, as well in other respects, it shows a certain similarity to *Ch. bicolor* Balz., from which it, however, differs by colour and shape of coxæ and legs.

24. Chelifer bicolor Balz. (Plate XXX. figs. 15 *a–e*.)

1891. *Trachychernes bicolor* Balzan, (11) pp. 524–525, pl. 10. figs. 16–16 *a*.

Male.

Cephalothorax.—Small, fairly distinct *ocular* spots are found. The cephalothorax, which is slightly longer than wide, has two fairly distinct, almost straight transverse *grooves*. The integument is distinctly granular, except on the two white spots of the second tergite, and bears a number of short, slightly clavate hairs.

Abdomen (Pl. XXX. fig. 15 *c*).—The abdomen is long and slender, and all its tergites are longitudinally divided; the dark spots of the tergites are granular, and from 10–12 moderately long, obtuse or slightly clavate *hairs* are placed along the hinder margin of the tergites, which in addition possess two lateral and two median hairs in front of the row, the last-mentioned not very distinctly so. The eleventh tergite has a pair of rather short "tactile" hairs. All the sternal sclerites are well developed, and all but the eleventh longitudinally divided by a broad band. The *genital* area had the anterior plate much longer than the posterior (fig. 15 *c*).

Antennæ.—The terminal hair extends distinctly beyond the very short, somewhat pointed *galea*, which has a tiny median as well as two terminal teeth.

Palps (Pl. XXX. figs. 15 *a–b*).—The *maxillæ* are almost smooth in the middle, but laterally granular; the palps are minutely granular, except the fingers and the hand below; the hairs of the proximal joints are obtuse and dentated, rather short, and passing over into the moderately long, simple, or almost simple of the hand and fingers. The *trochanter*, which is 1·5 as long as wide, is anteriorly moderately convex, while posteriorly it is slightly produced beyond the stalk; dorsally it is produced into a somewhat conical protuberance, only slightly pronounced. The *femur* has a short and well-defined stalk, beyond which it is distinctly widened out to a point somewhat beyond the middle and then becomes slightly attenuated. It is 2·3 as long as wide; the anterior outline is slightly convex and then concave, while the posterior outline is rather abruptly convex beyond the stalk, in the middle slightly concave, and then a trifle convex. The *tibia*, which has a rather short and fairly well-marked stalk, is a little longer and wider than the femur and 2·2 as long as wide; anteriorly beyond the stalk it is convex and then slightly concave terminally, while the posterior outline beyond the condylus is almost straight, as the basal elevation is very insignificant, and then slightly convex. The *chela*, which is about 2·4 as long as wide, is 1·4 broader than the trochanter is long; the hand, which is as long as but 1·5 wider than the tibia, is 1·4 as long as broad, but only 1·1 longer than deep, is 1·2 deeper than broad and about 1·4 longer than finger, which is a trifle longer than the hand is broad; the lateral outlines are moderately convex and so is the ventral, but the dorsal is almost semicircular. The number of *accessory* teeth seems to be fairly constant, viz. anteriorly about five on both fingers and posteriorly about ten.

The number of "*spots*" shows rather marked variations, at least anteriorly, where I have examined a good many specimens, but their arrangement is nevertheless fairly characteristic; the immovable finger possesses anteriorly, in the area between the four tactile hairs and near to it, from 15–20 "spots," while the movable finger has two or three; the immovable finger has posteriorly about six "spots" basally and a single median one, and the movable finger five in the basal third.

Coxæ (Pl. XXX. fig. 15 *c*).—The coxæ of the second and third pair are both widened out towards the extremity; the second pair are rather suddenly restricted towards the base and consequently the interior margin is shorter than that of the third pair. The *fourth pair*, which are widened out towards the end, have the short interior margin gradually merging into the posterior, almost straight one.

Legs.—The proximal joints are indistinctly granular. Hairs of dorsal side slightly clavate or obtuse and rather short; those of ventral surface are longer, pointed, and almost simple or completely so; the tarsal "*tactile*" hair is at least three-fourths removed from the base and distinctly longer than its distance to tip. The trochantin of the first pair is scarcely as deep as the femur proper, and the tibia is almost 1·1 as long as the *tarsus*, which is 3·9 as long as deep. The *femur* of the fourth pair of legs is 2·2 as long as deep, 1·1 as long as the tibia, and 1·5 lower than the tarsus is long; the *tibia* of the fourth pair of legs is somewhat club-shaped, being distinctly convex terminally, not as usually in the middle.

Colour.—Palps dark brown, almost black, with the stalks and extremities lighter; the head, first thoracic tergite and a median spot on the second are blackish, while the lateral parts of the second tergite are white. The abdominal tergites have on each side a black spot near to the middle, a brown one more laterally placed, and a brown band along the front margin of the tergite, connecting the two; the rest of the dorsal surface is white; the sternites are brown and divided by a longitudinal white band.

Measurements.—Cephalothorax 0·759 (0·736); abdomen 1·886 (0·989) mm.

Palps: trochanter 0·368 (0·240); femur 0·690 (0·299); tibia 0·713 (0·322); hand 0·713 (0·515), depth 0·635; finger 0·529 mm.

Leg I.: femur 0·418 (0·167), trochantin 0·076 (0·160); tibia 0·319 (0·110); tarsus 0·296 (0·076) mm.

Leg IV.: femur 0·532 (0·243); tibia 0·464 (0·129); tarsus 0·357 (0·099) mm.

Female.

Abdomen (Pl. XXX. fig. 15 *e*).—The number of hairs in the hindmost row of the tergites is somewhat greater (from 12–14) and the median hair is placed more distinctly in front of the row. The abdominal sclerites are not well pronounced ventrally; a large number of hairs in an elongated area in front of the sexual area (fig. 15 *e*).

Antennæ.—The *galea* extends slightly beyond the terminal hair and has three pairs of distal short branches (*cf.* Balzan, fig. 16 *a*).

Palps (Pl. XXX. fig. 15 *d*).—The proximal joints of the palps scarcely differ, but the *chela* is distinctly different, being 2·6 as long as wide; the *hand*, which is 1·5 as long as wide and 1·4 as long as deep, is only 1·1 deeper than broad and 1·5 longer than the fingers, which are somewhat longer than the hand is broad; the dorsal outline is distinctly convex, but far from being semicircular. The number of *accessory* teeth seems to be somewhat smaller; the difference in arrangement of spots is not greater than that between different specimens of the male.

Coxæ (Pl. XXX. fig. 15 *e*).—The fourth pair are distinctly wider, with the inner margin only a little shorter than the hinder.

Legs.—The legs seem to be somewhat longer and more slender, the *femur* of the fourth pair being, for instance, 2·6 as long as deep and 1·6 lower than tarsus is long; the tibia of the fourth pair has the usual shape and is four times as long as deep.

Colour.—The palps and the cephalothorax are somewhat lighter and so are the brown areas on the abdominal tergites, which are somewhat larger; the median and lateral dark spots are not only fused in front but also behind, so that a dark area with a white spot in the middle is established.

Measurements.—Cephalothorax 0·713 (0·736); abdomen 2·875 (1·265) mm.

Palps: trochanter 0·368 (0·240); femur 0·713 (0·310); tibia 0·736 (0·335); hand 0·782 (0·506), depth 0·565; finger 0·529 mm.

Leg I.: femur 0·456 (0·175), trochantin 0·084 (0·182); tibia 0·342 (0·118); tarsus 0·319 (0·080) mm

Leg IV.: femur 0·631 (0·243); tibia 0·547 (0·137); tarsus 0·395 (0·104) mm.

Material &c.—Dr. Meinert collected from 20/vi.–1/ix., 1891, numerous specimens (5 ♂, 10 ♀) of this pretty species in Venezuela, where it seems to live under the bark of trees; Dr. Meinert at least mentions localities where they have been collected under bark, while it is not found amongst the numerous specimens which were captured by sifting. A single male carried a small worm in its large chela. Balzan's specimens are from Petare and Caracas.

Remarks.—This species is well characterised by its colour and deep chela.

25. Chelifer albomacualtus Balz. (Plate XXX. fig. 16 *a*; text-fig. 67.)

1891. *Trachychernes albomaculatus* Balzan, (11) pp. 526–527, pl. 10. fig. 17.

Male.

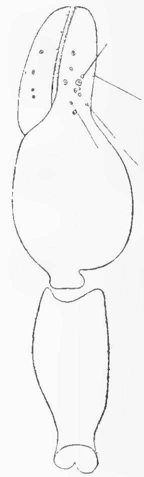
Cephalothorax.—*Ocular* spots very indistinct. The cephalothorax, which is distinctly wider behind than it is long, has two fairly distinct transverse *grooves*, of which the anterior is curved backwards and the posterior forwards in the middle. The integument all over is strongly and coarsely granular with rounded or pointed granules, and provided with moderately long, distinctly clavate hairs.

Abdomen.—The abdomen, which is only a little longer than wide, is flattened and of a very shining appearance; the tergites are longitudinally divided with the exception of the eleventh. All the tergites are strongly granular all over, and have along the posterior margin about 12 long, strongly clavate *hairs* in addition to two lateral ones, but they have scarcely any median hairs in front of the row. The "tactile" hairs of the eleventh tergite are missing in the specimens examined.

Antennæ.—The terminal hair extends in a very high degree beyond the short *galea*, which is rather clumsy, somewhat attenuated, with three short terminal teeth.

Palps (Pl. XXX. fig. 16 *a*; text-fig. 67).—The *maxillæ* are granular, most distinctly laterally; the palps are distinctly granular above with the exception of the hand; the ventral side is less distinctly granular and the fingers are smooth. The *hairs* of the femur and the trochanter, especially anteriorly, are long, strongly clavate, somewhat curved, and directed forwards; the hairs of the two following joints increase in length and slenderness towards the fingers, in which the pointed hairs are completely simple or provided with one or several median teeth. The *trochanter*, which is 1·5 as long as wide, is strongly convex anteriorly, but posteriorly slightly produced ventrally; dorsally it is produced into a fairly high rounded protuberance. The *femur* has a fairly long and well-defined stalk, beyond which it is widened out to a point somewhat behind the tip and then is a little attenuated. It is 2·7 as long as wide; the anterior outline is very slightly convex and then concave, while the posterior is gradually and moderately convex beyond the stalk and then with a moderate concavity or even incision, distally passing into a slightly marked convexity, which is again terminally followed by a concavity. The *tibia*, which has a long and fairly well-marked stalk, is almost as long as the femur, but distinctly wider and 2·2 as long as wide; anteriorly, beyond the stalk, it is fairly distinctly convex and terminally slightly concave, while the posterior outline beyond the fairly pronounced condylus is almost straight and then slightly convex. The *chela*, which is about 2·5 as long as wide, is 1·3 wider than the trochanter is long; the *hand*, which is almost as long as but 1·4 wider than tibia, is almost 1·5 longer than both wide and deep, a trifle wider than deep, and 1·4 as long as fingers, which are a little longer than hand is broad; the lateral outlines as well as the ventral are moderately convex, while the dorsal one is very distinctly convex. The fingers gape a trifle when closed, and each bears anteriorly two or three *accessory* teeth. Posteriorly each finger has about eight accessory teeth. The number of the "*spots*" and the arrangement are a little variable in the specimen, but the arrangement in the main is the same as that in the figures; anteriorly the immovable finger has a single "spot" behind the basal hair, four beyond and behind the median hair, and three in

Text-fig. 67.



Ch. albomaculatus Balz., ♂. Chela and tibia of right palp in anterior view. × 44.

the middle along the lower margin; while the movable finger has four in a longitudinal row; posteriorly, the movable finger has about four in the middle, and the immovable four basally and a single median one more apart.

Coxæ.—The coxæ are very similar to those of *Ch. bicolor* Balz., but the second pair are less restricted basally, and the fourth pair are scarcely widened out towards the end.

Legs.—The proximal joints are granular. The hairs of the dorsal side are long and distinctly clavate in the fourth pair of legs, moderately so in the first pair; the hairs of the lower surface are pointed and simple or almost so; a rather short tarsal "*tactile*" hair $\frac{4}{5}$ removed from the base is found. The legs are fairly long and slender; the trochantin of the first pair is distinctly deeper than the femur proper and the tibia is a trifle shorter than the *tarsus*, which is 4·6 as long as deep. The *femur* of the fourth pair of legs, which is 2·9 as long as deep, is 1·1 as long as the tibia, and 2 lower than the tarsus long.

Colour.—The palps are dark brown with the stalk and the extremities lighter, and so is the cephalothorax, except two white spots on the second tergite laterally. The abdomen is dark brown with the exception of a broad longitudinal band, which is widest in the median segments, and consequently appears to be somewhat zigzag, and a spot on each half of a tergite; the colour of the band and the spots is white or yellowish.

Measurements.—Cephalothorax 0·851 (0·920); abdomen 1·265 (1·150) mm.

Palps: trochanter 0·368 (0·253); femur 0·745 (0·276); tibia 0·736 (0·335); hand 0·713 (0·483), depth 0·460; finger 0·506 mm.

Leg I.: femur 0·464 (0·148), trochantin 0·114 (0·160); tibia 0·334 (0·106); tarsus 0·350 (0·076) mm.

Leg IV.: femur 0·593 (0·205); tibia 0·517 (0·129); tarsus 0·410 (0·095) mm.

Female.

Antennæ.—The *galea* extends beyond the terminal hair, and possesses three pairs of distal short branches.

Palps.—The proximal joints scarcely differ; the *hand* is comparatively wider, namely 1·5 wider than the tibia; it is 1·6 longer than deep, and wider than the fingers are long. The "*spots*" in the main are arranged as in the male, the most important difference being that the movable finger has only three "spots" anteriorly; in one specimen I found two spots behind the basal hair anteriorly.

Legs.—The legs are perhaps a little more slender, the *tarsus* of the first pair of legs being, for instance, 4·9 as long as deep and the *femur* of the fourth pair 3·1.

Measurements.—Cephalothorax 0·920 (1·104); abdomen 1·840 (1·610) mm.

Palps: trochanter 0·460 (0·310); femur 0·897 (0·330); tibia 0·897 (0·400); hand 0·897 (0·598), depth 0·552; finger 0·575 mm.

Leg I.: femur 0·532 (0·160), trochantin 0·122 (0·178); tibia 0·403 (0·114); tarsus 0·410 (0·084) mm.

Leg IV.: femur 0·714 (0·228); tibia 0·631 (0·137); tarsus 0·471 (0·108) mm.

Variation.—A female from La Guayra differed from the described specimen by its smaller size, its less slender palps and legs, and by the colour of the abdomen, which had the longitudinal band of equal breadth throughout and the lateral spot better pronounced.

Material &c.—Of this species I have examined two males, six females (of which one carried a bundle of eggs), and two young animals from New Granada (Keyserling Coll.). In addition to the above-mentioned badly-preserved specimens, I have had at my disposal a female collected by Dr. Meinert in the month of July on a road, La Guayra. Balzan's specimens are from Venezuela.

Remarks.—The described specimens differ in a slight degree from Balzan's description by the colour and the proportion of the joints of the palps. It is easily distinguished from *Ch. bicolor* Balz. by the shape of the femur of the palps with its strongly clavate hairs, and by its colour.

26. Chelifer crassimanus Balz. (Plate XXX. figs. 17 *a–b*; text-figs. 68 & 69.)

1890. Balzan, (10) pp. 421–423, tav. xiv. figs. 8–8 *c*.
1891. *Trachychernes crassimanus* Balzan, (11) p. 548.
1905. Ellingsen, (18) pp. 13–15.
1907. Tullgren, (23) pp. 71–72.

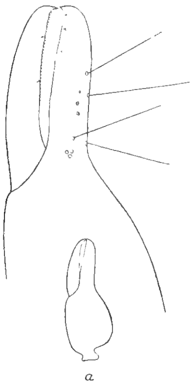
Cephalothorax.—Fairly distinct *ocular* spots or perhaps real eyes, as they show traces of a curved lens. The cephalothorax, which is distinctly longer than wide, has two prominent, deep, almost straight, transverse *grooves*. The integument of the head, the first thoracic tergite, and the black spot in the middle of the second are distinctly and coarsely granular, and provided with rather short and moderately clavate hairs, somewhat inclined.

Abdomen (Pl. XXX. fig. 17 *a*).—The fairly long and slender abdomen has all the tergites, with the exception of the hindmost part of the eleventh, divided by a broad longitudinal band. All the tergites are distinctly granular, and the median bear from 12–16 fairly long and moderately clavate *hairs* (fig. 17 *a*) along the hindmost margin, in addition to two lateral and two median hairs most distinctly in front of the row. The eleventh tergite bears a pair of short "tactile" hairs.

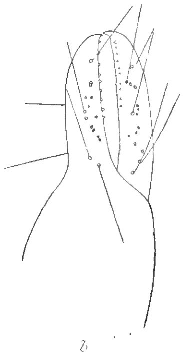
Antennæ.—The *galea* extends beyond the terminal hair, and bears about eight short distal branches.

Palps (Pl. XXX. fig. 17 *b*; text-figs. 68 & 69).—The *maxillæ* are slightly granular in the middle and behind, but very distinctly so laterally and in front; the palps are distinctly and coarsely granular all over, with the exception of the almost smooth fingers. The palps bear many rather short or moderately long *hairs*, which are moderately clavate on the femur and slightly clavate or obtuse on the two following joints; those of the fingers are not very long, pointed, and generally broken, with one or a few median teeth. The *trochanter*, which is 1·5 as long as broad, is anteriorly moderately convex, but posteriorly moderately produced and dorsally prolonged into a fairly deep and well-marked, somewhat conical eminence. The *femur* has a fairly

Text-fig. 68.



Text-fig. 69.



Ch. crassimanus Balz., ♀.—Chela of right palp in anterior (*a*) and posterior (*b*) view. × 44.

long and well-marked stalk, beyond which it is widened out to a point somewhat behind the tip and then is in a slight degree attenuated. It is about 2·5 as long as wide; the anterior outline is very slightly convex and then concave, while the posterior is rather suddenly convex just beyond the stalk, almost straight in the middle and slightly convex distally. The *tibia*, which has a moderately short and well-marked stalk, is a little longer, but distinctly wider than the femur, and 2·2 as long as wide; anteriorly, beyond the stalk, it is distinctly convex and then slightly concave, while the posterior outline, beyond the small condylus and insignificant basal elevation, is almost straight and then moderately convex. The *chela*, which is 2·8 as long as wide, is only 1·1 broader than the trochanter is long; the *hand*, which is as long as, but 1·4 wider than the tibia, is 1·5 as long as wide, a trifle deeper than wide, and scarcely 1·2 as long as the fingers, which are much longer than hand is deep and do not gape when closed; the lateral outlines are distinctly convex, and so is the dorsal, the latter is basally more suddenly produced, while the ventral side is only slightly convex. The fingers bear three or two *accessory* teeth anteriorly, and about ten posteriorly. The immovable finger has three *spots* anteriorly behind the basal hairs and three in a longitudinal row beyond, and the movable finger has none, while posteriorly the immovable finger has ten spots and the movable about twelve in the middle.

Coxæ.—The coxæ are almost the same as in *Ch. bicolor* Balz., the only difference being that the third pair have the anterior and inner corner produced into a short blunt process (*cf.* fig. 15 *e*).

Legs.—The proximal joints are granular. The hairs of the dorsal surface are moderately long and slightly clavate or obtuse, those of the ventral side are generally pointed and simple, seldom dentated and obtuse. A tarsal "*tactile*" hair, a little longer than its distance to the tip and three-fourths removed from the base, is found. The legs are fairly long and slender; the trochantin of the first pair is much deeper than the femur proper; the tibia is of almost equal length with the *tarsus*, which is five times as long as deep. The *femur* of the fourth pair of legs is almost three times as long as deep, 1·1 as long as tibia, and about 2·2 lower than the tarsus is long.

Colour.—The palps are dark brown and so is the cephalothorax, with the exception of the second tergite, which only has a small triangular black spot in the middle. The abdominal tergites are light brown with the longitudinal band and a spot on each side yellowish.

Measurements.—Cephalothorax 0·920 (0·805); abdomen 2·070 (1·380) mm.

Palps: trochanter 0·483 (0·322); femur 0·805 (0·345); tibia 0·828 (0·391); hand 0·828 (0·552), depth 0·565; finger 0·713.

Leg I.: femur 0·578 (0·175), trochantin 0·122 (0·195); tibia 0·433 (0·114); tarsus 0·426 (0·084) mm.

Leg IV.: femur 0·707 (0·243); tibia 0·646 (0·140); tarsus 0·517 (0·095) mm.

Variation.—The other specimen which was examined only differed by the number and arrangement of the "*spots*"; anteriorly the immovable finger has either one or two "spots" behind the basal hairs, and two behind and one beyond the terminal hair; posteriorly the most important differences are that the immovable finger has only two "spots" beyond the median hair, and that the movable seems only to possess five spots.

Material.—Dr. Meinert obtained two females by sifting in the month of August, at La Moka. This species had previously been collected in Paraguay and Brazil (Matto Grosso).

Remarks.—It is with the greatest hesitation that I have referred the above-described form to *Ch. crassimanus* Balz., as the hand is only 1·4 instead of 1·6 as wide as the tibia, and 1·2 instead of 1·4 longer than the fingers; from Ellingsen's description it differs besides by the maxillæ, which are not smooth, and by the tibia, which is not nearly smooth below. The only one of the mentioned characters which would justify the establishment of a new species is the longer fingers; but as the fingers of the male are only a little shorter than the hand, I think it better not to establish a new species. From the two preceding species, *Ch. crassimanus* Balz. differs by shape of the femur and its hairs as well as by its colour.

27. Chelifer meinertii, sp. n. (Plate XXX. figs. 18 *a–g*.)

Female.

Cephalothorax.—Two rather indistinct *ocular* spots. The cephalothorax, which is as long as broad, has a peculiar shape, as it is almost of equal breadth behind the median groove, but in front distinctly attenuated towards the front margin; two fairly prominent and deep, almost straight transverse *grooves* are found. The integument is strongly *granular*, with prominent, either rounded or conically pointed granules everywhere except on the two white spots of the second thoracic tergite, and it is provided with a number of short, fairly distinctly clavate hairs.

Abdomen (Pl. XXX. figs. 18 *a–b, g*).—The abdomen is obovate in shape, and is, in this female, which is distended with eggs, almost as wide as long. The distance between the seventh and eighth sclerites, for instance, is, in this specimen, longer than the sclerites, and the distance between the two lateral parts only slightly narrower than each half. All the tergites except the last are longitudinally divided by a broad band; their sclerites are distinctly granular. The hairs, which anteriorly are short and distinctly clavate, but posteriorly longer and only moderately so (figs. 18 *a–b*), are found on the median tergites numbering 10–12 along the hindmost margin; the median pair of these hairs, which are placed outside the dark portion of the tergite, are set scarcely in front of the row in contradistinction to a lateral hair on each side. The eleventh tergite has a pair of rather short "tactile" hairs. The hairy spot in front of the genital opening is triangular in shape (fig. 18 *g*).

Antennæ (Pl. XXX. fig. 18 *c*).—The *galea*, which has about six short distal branches, extends scarcely beyond the terminal hair (fig. 18 *c*).

Palps (Pl. XXX. figs. 18 *d–f*).—The *maxillæ* are smooth in the middle, but laterally, anteriorly, and even interiorly distinctly granular; the palps, with the exception of parts of fingers, are distinctly and coarsely granular. The palps bear a number of more or less short *hairs*, which on the trochanter and the femur are strongly clavate, while the two following joints bear more or less distinctly clavate or obtuse hairs; those of the fingers are generally short, pointed, and broken, with a single or a few median teeth. The *trochanter*, which is about 1·3 as long as wide, is moderately convex anteriorly, but posteriorly it is rather suddenly produced, dorsally only slightly so. The *femur* has a rather short well-defined stalk, beyond which it is of almost equal breadth throughout (broadest in the middle). It is 2·4 as long as wide; the anterior outline is a trifle convex and then concave, while the posterior, beyond the rather sudden basal convexity, is almost straight and then a trifle convex. The *tibia*, which has a rather short and well-marked stalk, is as long as and a little wider than the femur, and twice as long as broad; anteriorly, beyond the stalk, it is suddenly and distinctly convex and then slightly concave, while the posterior outline, beyond the small condylus and insignificant basal elevation, is almost straight and then moderately convex. The *chela*, which is 2·5 as long as wide, is 1·3 as broad as the trochanter is long; the *hand*, which is a little longer, but 1·5 wider than the tibia, is 1·4 as long as wide, a little deeper than wide and 1·3 as long as fingers, which are a little longer than hand deep, and do not gape when closed; the lateral outline, as well as the dorsal which is more suddenly produced, is distinctly convex, while the ventral is only slightly so. Both fingers bear anteriorly two distal *accessory* teeth (*cf.* fig. 18 *e*), while the immovable finger has posteriorly 9 teeth and the movable as many as 12, placed from near the base to almost the tip (*cf.* fig. 18 *f*). The immovable finger possesses anteriorly three "*spots*" behind the basal hair, six in the area between the four "tactile" hairs, and four in a longitudinal row near to the lower margin, while the movable finger has about eight in a longitudinal row from the base to near tip (fig. 18 *e*); posteriorly the immovable finger has about ten and the movable eight "spots" arranged as shown in fig. 18 *f*.

Coxæ (Pl. XXX. fig. 18 *g*).—The coxæ are very similar to those of *Ch. bicolor* Balz. (*cf.* fig. 15 *e*), the only difference being that the third pair are basally restricted, and that these, as well as the second pair, show traces of an anterior blunt basal process: the fourth pair are besides more slender.

Legs.—The proximal joints are only very indistinctly granular. The hairs of the dorsal surface are moderately long, and distinctly clavate in the fourth pair of legs, but slightly clavate or obtuse in the first pair, while those of the ventral surface are pointed and more or less simple. The tarsal "*tactile*" hair, which is distinctly longer than the distance to the tip, is three-fourths removed from the base. The legs are fairly long and slender; the trochantin of the first pair is much deeper than the femur proper; the tibia is a little shorter than the *tarsus*, which is 4·5 as long as deep. The *femur* of the fourth pair of legs is 2·7 as long as deep, 1·1 longer than the tibia, and almost 1·9 lower than tarsus long.

Colour.—The three proximal joints of the palps are yellowish brown with the basal and terminal part lighter; the chelæ are dark brown, and so is the cephalothorax with the exception of two white spots, which in the middle are separated by a median quadrangular dark spot and laterally bounded by a narrow dark stripe. The tergal sclerites of the abdomen are brownish, and the membranes between are yellowish.

Measurements.—Cephalothorax 0·690 (0·690); abdomen 1·725 (1·495) mm.

Palps: trochanter 0·335 (0·207); femur 0·598 (0·253); tibia 0·598 (0·285); hand 0·621 (0·437), depth 0·437; finger 0·495 mm.

Leg I.: femur 0·395 (0·132), trochantin 0·084 (0·140); tibia 0·296 (0·091); tarsus 0·312 (0·068) mm.

Leg IV.: femur 0·532 (0·200); tibia 0·479 (0·114); tarsus 0·372 (0·080) mm.

Material.—Of this pretty species I have examined a single female, collected by Dr. Meinert in the month of January on a road "Old la Guayra (Caracas)"; I have named this species after Dr. Meinert, who collected such a number of these animals in Venezuela.

Remarks.—The described species is in most respects very similar to the preceding, but it seems, nevertheless, as far as can be judged with only a single specimen at one's disposal, to be well characterised by the shorter and more distinctly clavate hairs especially of the femur, by the shorter finger, by the longitudinal row of spots anteriorly on the movable finger, and by the second thoracic tergite, which has two white spots. From *Ch. bicolor* Balz. and *Ch. albomaculatus* Balz. it differs in colour and in the shape of the femur and hairs.

28. Chelifer subrotundatus Balz. (Plate XXX. figs. 19 *a–c*.)

1891. *Trachychernes subrotundatus* Balzan, (11) pp. 522–523, pl. 10. figs. 14–14 *a*.

Female.

Cephalothorax.—*Ocular* spots almost obsolete. The cephalothorax, which is of almost equal length and width, is provided with two transverse *grooves*, of which the anterior is fairly prominent and slightly curved backwards in the middle, while the posterior is indistinct. The integument is distinctly and coarsely granular, except on the two large white spots of the second tergite, and is provided with short obtuse hairs.

Abdomen.—The abdomen is fairly long and slender, and has all its tergites except the eleventh longitudinally divided by a broad band. The sclerites are granular, and the tergites bear 8–10 *hairs* along the hindmost margin as well as a lateral hair on each side, but there is no median hair in front of the row; the hairs are slender, fairly long or long, obtuse or even slightly clavate. The eleventh tergite has a pair of rather short tactile hairs. The abdomen has behind the first pair of sclerites and in front of the vulva an area with about 30 short hairs placed close together.

Antennæ.—The short *galea*, which has only about six distal teeth, scarcely extends beyond the terminal hair.

Palps (Pl. XXX. figs. 19 *a–c*).—The *maxillæ* are smooth in the middle and granular laterally; the palps are fairly distinctly granular, but the lower side, the hand, and of course the fingers are less distinctly so, and are, indeed, more or less smooth. The fairly long hairs are obtuse in the trochanter and femur, but pointed and dentated on the hand. The *trochanter*, which is 1·5 as long as wide, is moderately convex anteriorly, but posteriorly is scarcely produced below, and dorsally has a very low rounded protuberance. The *femur* has a short and well-defined stalk, beyond which it is somewhat widened out and then in a slight degree attenuated. It is 2·2 as long as wide; the anterior outline is slightly convex and then concave, while the posterior, beyond the not very sudden basal convexity, is almost straight and then a trifle convex. The *tibia*, which has a short well-marked stalk, is almost as long as and somewhat broader than the femur, and twice as long as wide; anteriorly, beyond the stalk, it is strongly convex and then slightly concave, while the posterior outline beyond the prominent condylus and insignificant basal elevation is at first almost straight and then moderately convex. The *chela*, which is about 2·7 as long as wide, is almost 1·3 as broad as the trochanter is long; the *hand*, which is somewhat longer and scarcely 1·5 wider, is 1·6 as long as wide, a little wider than deep, and 1·4 as long as the fingers, which are distinctly longer than the hand is wide and do not gape when closed; the lateral outlines are moderately convex, while the dorsal outline beyond the stalk is at first abruptly convex and then slightly so. The immovable finger bears anteriorly, as well as posteriorly, three accessory teeth, while the movable finger has two only. The number of "*spots*" is small, for the immovable finger has only four and three, anteriorly and posteriorly respectively, while the movable finger has only a single one on each side; they are arranged as shown in figures (figs. 19 *b–c*).

Coxæ.—The second and the third pair are very similar to those of *Ch. bicolor* Balz. (*cf.* fig. 15 *e*), but seem to be comparatively shorter; the fourth pair have the comparatively shorter inner margin merging into the hinder without any limitation, and are slightly widened out towards the extremity.

Legs.—The proximal joints are only indistinctly granular. The fairly long hairs are dorsally slightly clavate, obtuse or dentated, and ventrally pointed and more or less simple; the tarsal "*tactile*" hair is two-thirds removed from, and much longer than distance to, tip. The legs are moderately long and slender; the trochantin of the first pair is scarcely deeper than the femur proper, and its tibia scarcely as long as the *tarsus*, which is 3·9 as long as deep. The *femur* of the fourth pair is 2·5 as long as deep, almost 2·2 as long as the tibia, and 1·7 lower than the tarsus is long.

Colour.—Palps are reddish brown; cephalothorax dark brown, with the exception of the yellow second tergite, which has a quadrangular black spot in the middle. Tergal sclerites brown.

Measurements.—Cephalothorax 0·621 (0·600); abdomen 1·610 (1·081) mm.

Palps: trochanter 0·276 (0·184); femur 0·481 (0·227); tibia 0·483 (0·240); hand 0·552 (0·345), depth 0·335; finger 0·375 mm.

Leg I.: femur 0·312 (0·122), trochantin 0·076 (0·122); tibia 0·228 (0·085); tarsus 0·236 (0·061) mm.

Leg IV.: femur 0·410 (0·167); tibia 0·350 (0·106); tarsus 0·281 (0·072) mm.

Material.—Of this species I have examined a single female, collected by Dr. Meinert on a road in the month of July, La Guayra (Caracas). Balzan's specimens are also from Venezuela.

Remarks.—That the animal described really belongs to *Ch. subrotundatus* is somewhat doubtful, as the latter has the cephalothorax longer than wide, the femur of the palps only twice as long as wide, a prominent basal elevation on the tibia posteriorly, and the hand basally much more abruptly convex, especially anteriorly; the two last-mentioned structures may perhaps be explained by the fact that the chela has not been figured in a true dorsal view, and that they have been somewhat exaggerated by the artist as well as the engraver.

29. CHELIFER PLUMOSUS, sp. n. (Plate XXX. figs. 20 *a–e*.)

Female.

Cephalothorax.—Large rather indistinct *ocular* spots. The cephalothorax, which is a little longer than wide, has two prominent, almost straight, transverse *grooves*. The integument of the head and first thoracic tergite as well as of the small black spot on the second tergite is strongly granular all over with rounded or pointed granules and is provided with short distinctly clavate hairs.

Abdomen (Pl. XXX. fig. 20 *e*).—The fairly long and slender abdomen has all the tergites with the exception of the eleventh longitudinally divided by a broad band. The sclerites, which on the first tergite are represented by a mere transverse line, are distinctly granular. From 12–14 distinctly clavate *hairs*, short in front and fairly long behind, are placed along the hindmost margin of each tergite, which possesses besides a median hair, placed within the longitudinal band, slightly in front of the row, and a lateral one distinctly so placed, at least in the median segments. The eleventh tergite as well as the corresponding sternite bears a pair of "tactile" hairs. The hairy spot in front of the vulva is rather small and insignificant (fig. 20 *e*).

Antennæ.—The rather short *galea* extends a trifle beyond the terminal hair and has six rather short distal branches, decreasing towards the end.

Palps (Pl. XXX. figs. 20 *a–c*).—The *maxillæ* are smooth in the middle, laterally granular; the palps are very distinctly granular with the exception of the more or less indistinctly granular lower surface and completely smooth fingers. The short *hairs* of the three proximal joints are anteriorly more or less distinctly clavate, but posteriorly obtuse or dentated, sometimes similar to those of the hand; these, which are so numerous that the hand appears somewhat shaggy, are slightly curved with the end directed forwards, or, more correctly, the distal half makes an obtuse or even a right angle with the proximal; the basal portion is without any teeth, while the distal has about ten short teeth and consequently has a somewhat plumose appearance (fig. 20 *d*). The *trochanter*, which is 1·5 as long as wide, is anteriorly moderately convex and posteriorly fairly distinctly produced, but very slightly so dorsally. The *femur* has a short and distinct stalk, beyond which it is of almost equal breadth throughout, but for the slightly attenuated terminal part. It is 2·3 as long as wide; the anterior outline, beyond the stalk, is very slightly convex and then concave, while the posterior is rather suddenly convex and then almost straight. The *tibia*, which has a moderately long and well-marked stalk, is a little longer and broader than the femur and 2·2 as long as wide; anteriorly it is, beyond the stalk, moderately convex and terminally a trifle concave, while the posterior outline, beyond the fairly big condylus, is at first almost straight and then moderately convex. The *chela*, which is 2·4 as long as wide, is 1·4 as broad as the trochanter is long; the *hand*, which is of almost equal length to and 1·6 wider than the tibia, is 1·4 as long as wide, scarcely

1·1 as deep as wide, and 1·5 as long as the fingers, which are a trifle shorter than the hand is broad and scarcely gape when closed; the lateral outlines of the hand are distinctly convex, and so is the dorsal, which is, however, more suddenly raised beyond the stalk, while the ventral is only slightly convex. The fingers bear anteriorly only two accessory teeth each, while the number posteriorly is about ten. Anteriorly the immovable finger has basally between the tactile hairs about four "*spots*" and farther down three much smaller ones, while the movable finger has seven in a longitudinal row from near the base to near the end; posteriorly the immovable finger has eight "spots" in two groups and the movable finger has seven spots (*cf.* figs. 20 *b–c*).

Coxæ (Pl. XXX. fig. 20 *e*).—The third and the second pair are similar to those of *Ch. bicolor* Balz., the latter being distinctly narrower at the base; the fourth pair are rather peculiarly shaped, being slightly pointed interiorly and in the front, and scarcely widened out towards the extremity, with the inner margin, which is the shorter, distinctly merging into the hinder.

Legs.—The proximal joints are very slightly granular. The rather short hairs are either moderately or slightly clavate, or obtuse, dorsally, in the fourth and first pair of legs respectively; those of the ventral side are pointed and more or less simple; a tarsal "*tactile*" hair, much longer than the distance to the tip, is two-thirds removed from the base. The legs are not very slender and the trochantin of the first pair is deeper than the femur proper, while its tibia is a trifle longer than the *tarsus*, which is almost four times as long as deep. The *femur* of the fourth pair is about 2·3 as long as deep, scarcely 1·1 as long as the tibia, and 1·6 lower than the tarsus is long.

Colour.—The palps are light brown with the chela much darker; the head, first tergite, and a tiny median spot of the second tergite are light brown, darker than the proximal joints of the palps; the dorsal side of the abdomen has brown sclerites and the skin between white; the white transverse band in the middle of the body encompasses almost the whole second thoracic tergite and the first abdominal with the exception of a transverse darker line.

Measurements.—Cephalothorax 0·647 (0·621); abdomen 1·265 (0·828) mm.

Palps: trochanter 0·276 (0·184); femur 0·506 (0·217); tibia 0·515 (0·230); hand 0·529 (0·375), depth 0·400; finger 0·368 mm.

Leg I.: femur 0·327 (0·125), trochantin 0·070 (0·133); tibia 0·251 (0·084); tarsus 0·236 (0·061) mm.

Leg IV.: femur 0·418 (0·182); tibia 0·388 (0·106); tarsus 0·288 (0·068) mm.

Material.—Of this beautiful little species I have examined a single female sifted in the month of August by Dr. Meinert, at La Moka.

Remarks.—The described species, which may be easily distinguished from all other species of this group by the singular feathery hairs of the hand, is probably nearly related to *Ch. subrotundatus* Balz. In the shape of the hairs of the hand it has some similarity to *Ch. armiger* Balz., but in other respects scarcely any.

30. Chelifer nitidimanus Ell. (Plate XXX. fig. 21 *a*; text-fig. 70.)

1905. Ellingsen, (18) pp. 11–12.

Female.

Cephalothorax.—Large rather indistinct *ocular* spots (*cf.* Ellingsen, 18.). The *cephalothorax*, which is distinctly longer than wide, has two distinct transverse *stripes*, which are slightly curved backwards in the middle. The integument is fairly distinctly granular with rather flat granules, with the exception of the almost smooth lateral white spots of the second tergite; the short hairs are slightly clavate.

Abdomen.—The fairly long and slender abdomen has all the tergites except the eleventh divided by a distinct longitudinal band. The sclerites are granular with scale-shaped granules, and bear along the hindmost margin of each pair six or eight fairly long slightly clavate *hairs* as well as a lateral one in front of the row (*cf.* Ellingsen); the eleventh tergite possesses a pair of "tactile" hairs. The hairy spot in front of the vulva is very insignificant.

Antennæ.—The fairly slender *galea*, which has at least six distal branches, extends slightly beyond the terminal hair. The *flagellum* consists of three hairs.

Palps (Pl. XXX. fig. 21 *a*; text-fig. 70).—The *maxillæ* are completely smooth; the trochanter and femur are distinctly granular and so is the tibia, but less distinctly; all these joints are smooth below, and so is the hand all over except anteriorly at the base of the fingers (*cf.* Ellingsen). The long hairs are either slightly clavate, as on the inner surface of the femur, or obtuse and dentated. The *trochanter*, which is about 1·6 as long as wide, is anteriorly moderately convex and posteriorly as well as dorsally slightly produced. The *femur* has a short and well-marked stalk, beyond which it is of almost equal breadth throughout, only very slightly attenuated towards the end. It is about 2·2 as long as wide; the anterior outline is very slightly convex and then a trifle concave, while the posterior is rather abruptly convex beyond the stalk, then straight and again terminally a trifle convex. The *tibia*, which has a moderately long and well-marked stalk, is a little longer and wider than the femur and about twice as long as broad; the anterior outline is fairly distinctly convex with a slight terminal concavity, while the posterior, beyond the moderately big condylus, is basally straight and then regularly and moderately convex with the most raised part a little beyond the middle. The *chela*, which is three times as long as wide, is almost 1·2 as broad as the trochanter is long; the *hand*, which is scarcely longer than the tibia, but 1·4 as wide, is almost 1·7 longer than broad, about 1·1 as deep as wide, and about 1·2 as long as the fingers, which are distinctly longer than the hand is deep and do not gape when closed; the lateral as well as the dorsal outlines of the hand

Text-fig. 70.

Ch. nitidimanus Ell., ♀. Chela of right palp in anterior view. × 77.

are moderately convex, while the ventral is almost straight. Both fingers possess anteriorly two *accessory* teeth near to the end, and posteriorly a few distally. The immovable finger is anteriorly adorned with about nine basal "*spots*" densely crowded (*cf.* text-fig. 70) and has posteriorly three between the three basally placed tactile hairs; while the movable has only two spots, placed basally.

Coxæ.—The second pair are only slightly narrower at the base; the fourth, trapezoidal pair, are much longer than wide, scarcely widened out towards the extremity, the inner margin is fairly well distinguished from the slightly concave and much longer hinder margin.

Legs.—The proximal joints are slightly granular. The fairly long hairs are slightly clavate or obtuse dorsally; those of the ventral side are pointed; the tarsal "*tactile*" hair, which is as long as its distance from the tip, is two-thirds removed from the base. The hairs are moderately long and slender, and the trochantin of the first pair of legs is scarcely deeper than the distal femoral part, while its tibia is as long as the *tarsus*, which is 3·7 as long as deep. The *femur* of the fourth pair of legs is 2·2 as long as deep, 1·2 as long as the tibia, and 1·6 lower than the tarsus is long.

Colour.—The palps, the head, and first thoracic tergite as well as a semicircular spot of the second, and the tergal sclerites are yellowish brown, while the rest of the thoracic tergite and the interstitial parts are yellowish or white.

Measurements.—Cephalothorax 0·529 (0·437); abdomen 1·150 (0·690) mm.

Palps: trochanter 0·228 (0·137); femur 0·395 (0·179); tibia 0·410 (0·190); hand 0·438 (0·266), depth 0·296; finger 0·360 mm.

Leg I.: femur 0·251 (0·106), trochantin 0·053 (0·106); tibia 0·182 (0·072); tarsus 0·182 (0·049) mm.

Leg IV.: femur 0·319 (0·144); tibia 0·274 (0·084); tarsus 0·228 (0·061) mm.

Material.—E. Simon collected a single female in St. Vincent, whilst Ellingsen's specimen was from Pará.

Remarks.—I have referred this specimen to *Ch. nitidimanus* Ell., in spite of its small size, lighter colour, less strongly convex outlines of tibia and hand, and shorter fingers. By its smooth hand it is distinguished from at least most South-American species.

31. CHELIFER MICHAELSENI Sim. (Plate XXX. figs. 22 *a–c*.)

1902. E. Simon, (14) p. 44.
1904. E. Ellingsen, (16) pp. 4–5.

Cephalothorax.—*Ocular* spots (?) rather indistinct; as their chitin is transparent, without granulation and slightly convex, they may perhaps be designated real eyes. The cephalothorax, which is somewhat longer than wide, has two transverse *grooves*, a wide and shallow anterior one almost straight and very prominent, and a posterior distinctly curved forwards in the middle and less prominent. The integument is distinctly granular on the head and first tergite, but less distinctly so on the second tergite and is provided with short obtuse hairs.

Abdomen.—The fairly long slender abdomen has apparently all tergites except the first and eleventh longitudinally divided. The sclerites are indistinctly granular, and about ten rather short and slightly clavate *hairs* are placed along the hinder margin of each tergite in addition to two lateral ones in front of the row. No "tactile" hair was observed in the eleventh segment in this badly preserved specimen. The sexual area is very prominent, with the anterior genital plate, which has its prominent hinder margin concave, longer than the posterior; chitinous apparatus as well as the accessory glands, visible through the transparent skin, very similar to those of *Ch. cimicoides* F.

Antennæ.—The rather short *galea* scarcely extends beyond the terminal hair and has about six short terminal branches.

Palps (Pl. XXX. figs. 22 *a–c*).—The *maxillæ* are smooth in the middle, but granular laterally; the three proximal joints are distinctly granular on the anterior surface, but more or less indistinctly so everywhere else; the *hand* seems to be granular only anteriorly and posteriorly, elsewhere being smooth. The fairly long or long hairs are obtuse and dentated or even slightly clavate. The *trochanter*, which is 1·5 as long as wide, is anteriorly moderately convex and posteriorly as well as dorsally slightly produced. The *femur* has a fairly short and well-defined stalk, beyond which it is of almost equal breadth throughout, but for the slightly attenuated terminal part. It is 2·4 as long as wide; anteriorly it is slightly convex and then concave, but posteriorly beyond the not very abrupt basal convexity almost straight and then terminally slightly convex. The *tibia*, which has a moderately long and well-marked stalk, is a little longer and wider than the femur, and 2·2 as long as wide; the anterior outline is moderately convex, while the posterior, beyond the slightly marked condylus and obsolete basal elevation, is almost straight and then slightly convex. The *chela*, which is three times as long as wide, is 1·2 broader than the trochanter is long; the *hand*, which is about as long as, and 1·4 as wide as, the tibia, is 1·6 as long as wide, a trifle wider than deep, and scarcely 1·2 as long as fingers, which are much longer than the hand is wide and gape slightly when closed; the lateral as well as the dorsal outlines are moderately convex, while the ventral is very slightly so. Anteriorly both fingers bear about six *accessory* teeth placed close together just beyond the middle, while the movable finger has four posteriorly and the immovable three; marginal row of teeth complete in both fingers. Anteriorly eight *spots*, placed in two groups (fig. 22 *b*), are found on the immovable finger and only a single one basally on the movable finger, while, posteriorly, the immovable finger is adorned with seven spots and the movable with three only (fig. 22 *c*).

Coxæ.—The coxæ are very similar to those of *Ch. celerrimus*, sp. n. (*cf.* below), but the second pair show traces of a basal narrowing, while the fourth pair are trapezoidal and of almost equal width throughout, with the inner margin much shorter and fairly well separated from the hinder one.

Legs.—The proximal joints are almost smooth. Dorsally the fairly long hairs are obtuse or dentated, ventrally pointed, and almost or completely simple. The tarsus of the fourth pair of legs possesses a "*tactile*" hair two-thirds removed from the base, and behind that, and removed one-third from the base, another large articular cavity; in the specimen examined no terminal "tactile" hair was observed at the tip of the femur and tibia as in *Ch. celerrimus*, sp. n. (*cf.* figs. 23 *d–e*). The legs are long and slender, and the trochantin of the first pair is much deeper than the femur proper, while its *tarsus*, which is 4·6 as long as deep, is 1·1 longer than the tibia; the *femur* of the fourth pair of legs is 2·8 as long as deep, 1·2 as long as tibia, and 2 lower than tarsus is long.

Colour.—The palps and the cephalothorax yellowish brown, the latter the lighter, with the chela more reddish brown. The abdomen is very pale, almost white.

Measurements.—Cephalothorax 0·759 (0·690); abdomen 1·610 (0·897) mm.

Palps: trochanter 0·345 (0·230); femur 0·647 (0·265); tibia 0·667 (0·299); hand 0·667 (0·414), depth 0·391; finger 0·575 mm.

Leg I.: femur 0·418 (0·129), trochantin 0·091 (0·144); tibia 0·312 (0·091); tarsus 0·342 (0·073) mm.

Leg IV.: femur 0·570 (0·205); tibia 0·464 (0·125); tarsus 0·410 (0·088) mm.

Material &c.—Of this species I have examined a single male from Rio Janeiro, collected by the Danish 'Galathea' Expedition; it has previously been recorded from Tierra del Fuego and Patagonia.

Remarks.—The specimen examined differs from Ellingsen's description (Simon's description of the typical specimens was not at my disposal) in mere trivialities, viz., ocular spots fairly distinct instead of wanting, second transverse groove convex instead of straight, better-marked granulations, and comparatively longer femur, and consequently it is most naturally referred to the same species. This species bears in the structure of the legs, &c., great similarity to *Ch. celerrimus*, sp. n., but is easily distinguished by the femur, which is scarcely attenuated.

32. Chelifer brevifemoratus Balz.

1890. Balzan, (10) pp. 420–421, tav. xiv. figs. 7–7 *c*.
1891. Balzan, (11) p. 548.
1902. Ellingsen, (15) pp. 156–158.
1905. Ellingsen, (19) p. 324.

This species is very nearly related to the following, to which I refer, as I have there enumerated the differences. It has been recorded from Paraguay and Ecuador.

33. Chelifer celerrimus, sp. n. (Plate XXX. figs. 23 *a–c*, *e*; Plate XXXI. fig. 23 *d*.)

Cephalothorax.—No *ocular* spots were observed. The cephalothorax, which is distinctly longer than wide, has a median fairly prominent transverse *groove*, which is slightly curved backwards in the middle; there is no posterior groove. The integument is minutely not very distinctly granular and the short hairs are slightly obtuse.

Abdomen.—The fairly long and slender abdomen has all the tergites, with the exception of the first and part of the eleventh, divided longitudinally. The tergites have smooth sclerites, and from 14–16 long, pointed, and terminally dentated hairs along the hindmost margin, in addition to four hairs in front of the row; these hairs increase in length from the base to the end of the abdomen, and from the middle towards the side in each tergite. The eleventh tergite and the corresponding sternite have each two pairs of "tactile" hairs.

Antennæ.—The *galea*, which extends somewhat beyond the terminal hair, has in the distal half two diverging branches, bearing respectively one and three branches (somewhat similar to Balzan's figure 7 *a* (10)).

Palps (Pl. XXX. figs. 23 *a–c*).—The *maxillæ* are almost smooth beneath; the palps are minutely and very distinctly granulated, the inner surface having the granulations most pronounced, the lower surface being almost smooth. The hairs are fairly long or long, are provided with a few teeth, and are scarcely pointed on the proximal joints, but distinctly pointed and almost simple or completely so on the distal joints. The *trochanter*, which is 1·5 as long as wide, is very slightly convex anteriorly; posteriorly it is slightly produced, and dorsally it is prolonged into a rounded, rather low protuberance. The *femur* has a short well-defined stalk, beyond which it tapers distinctly towards the end. It is about 2·2 as long as wide; the anterior outline is slightly convex and then concave, while the posterior is very abruptly convex beyond the stalk, straight in the middle, and then terminally a trifle convex. The *tibia*, which has a moderately long and well-marked stalk, is a little longer and wider than the femur, and is almost 2·2 as long as wide; the anterior outline is moderately convex with a scarcely marked terminal concavity, while the posterior, beyond the fairly big condylus and small but distinct basal elevation, is first almost straight and then slightly convex. The *chela*, which is three times as long as wide, is scarcely broader than the trochanter is long; the *hand*, which is about as long as the tibia, but 1·3 wider, is 1·6 as long as wide, scarcely deeper than wide, and 1·1 as long as the fingers, which are much longer than hand is deep and scarcely gape when closed; the lateral outlines are moderately convex, while the dorsal and ventral are only slightly so. The fingers each bear anteriorly a single *accessory* tooth, while posteriorly the movable finger has two and the immovable finger three teeth anteriorly. Eight "*spots*" are found in the basal half of the immovable finger, while posteriorly the immovable finger has four and the movable only one "spot" (*cf.* figs. 23 *b–c*).

Coxæ.—The coxæ are distinctly different from those of *Chelifer bicolor* Balz.; the second and the third pair are both widened out towards the end, especially the latter, as the former is much broader than this at the base and not suddenly narrower; the fourth pair are almost wider basally than distally, quadrangular, with the inner margin well separated from, and shorter than, the hinder one.

Legs (Pls. XXX.–XXXI. figs. 23 *d–e*).—The proximal joints are completely smooth; the fairly long or long hairs are pointed and completely simple or almost so; dorsally just behind the tip of the femur a very long and slender hair is observed in the fourth pair of legs; a similar hair, but even longer, is placed exactly in the same position in the tibia. The tarsus IV. has the "*tactile*" hair placed nearer to the base than to the tip, and it is a little longer than the latter distance (*cf.* fig. 23 *e*); between the "tactile" hair and the base another wide articular cavity is observed (*cf.* above). The legs are very long and slender, and the trochantin of the first pair of legs is much deeper than the femur proper, while its *tarsus*, which is about five times as long as deep, is 1·1 longer than the tibia. The *femur* of the fourth pair of legs is 3·2 as long as deep, 1·1 as long as tibia, and 2·3 lower than the tarsus is long.

Colour.—The palps, cephalothorax, and tergal sclerites are light brown, but of somewhat different shades.

Measurements.—Cephalothorax 0·552 (0·437); abdomen 1·541 (0·897) mm.

Palps: trochanter 0·266 (0·175); femur 0·410 (0·190); tibia 0·426 (0·198); hand 0·433 (0·266), depth 0·266; finger 0·385 mm.

Leg I.: femur 0·296 (0·084), trochantin 0·076 (0·099); tibia 0·228 (0·068); tarsus 0·251 (0·050) mm.

Leg IV.: femur 0·380 (0·118); tibia 0·342 (0·084); tarsus 0·266 (0·061) mm.

Material.—Of this species I have examined a single female with a bundle of eggs, collected by Mr. H. H. Smith in the month of March, in a half-shady place in a mixture of earth and old manure, at Balthazar (Windward), Island of Grenada.

Remarks.—This species is, as far as can be judged from Balzan's very imperfect description, in most respects similar to *Ch. brevifemoratus* Balz. (1890, 10. pp. 420–421, tav. xiv. figs. 7–7 *c*); but as it has no trace of ocular spots or second transverse groove, as it has smooth tergal sclerites with long and pointed hair instead of "setole . . . . corte, troncate all' apice et dentate," and as the palps are not granular all over, without "peli quasi clavati," and the inner outline of the tibia is moderately, not strongly, convex, I prefer to establish a new species, especially taking into consideration that the above-described form is at least not identical with one from Ecuador with "de poils claviformes," which Ellingsen (15. pp. 156–158) has referred to *Ch. brevifemoratus* Balz. It differs from *Ch. michaelsenii* Sim. by the attenuated femur of the palps.

In this place I shall mention a specimen, probably a young animal, from Bogota (Keyserling Coll.), on account of an abnormality (?) in the number of the tactile hairs of the fingers. The immovable finger had only three "tactile" hairs anteriorly and the movable only three posteriorly (*cf.* fig. 24 *a*, Pl. XXXI.).

34. CHELIFER PATAGONICUS Tullgr.

1900. Tullgren, (13) pp. 155–157, figs. 1–5.

Cephalothorax "finely punctuated," with two transverse *grooves*. Abdomen with slightly clavate hairs. Palps finely reticularly granular, clothed with short simple toothed hairs; *femur* about 3 as long as wide and *tibia* 2·3; the *hand* is 1·4 as wide as the tibia and as long as the finger.—Patagonia.

35. CHELIFER ELLINGSENII, sp. n. (Plate XXXI. figs. 25 *a–e*; text-fig. 71.)

Cephalothorax.—The *ocular* spots are very indistinct, sometimes even absent. The cephalothorax is distinctly longer than wide, and is provided with two almost straight, broad, transverse *stripes* or grooves, of which the anterior is much more prominent than the posterior. The integument is minutely, but distinctly granular, with pointed granules at least laterally in front of the posterior transverse groove; the hairs are very short and obtuse.

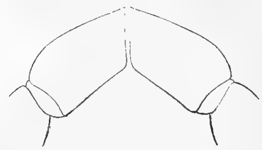
Abdomen.—The fairly long, slender abdomen seems to have all the tergites, with the exception of the first and eleventh, longitudinally divided. The sclerites appear almost smooth, and the tergites have along the hindmost margin from 10–14 short, obtuse or slightly clavate *hairs* in addition to four in front of the row on the median segments.

Antennæ.—The *galea* is rather short with about six distal branches or teeth, and extends in a slight degree beyond the terminal hair.

Palps (Pl. XXXI. figs. 25 *a–c*).—The *maxillæ* are indistinctly granular in the middle, but more distinctly so laterally; the palps are distinctly granular laterally, especially anteriorly, almost smooth dorsally and completely so ventrally. The short or very short hairs are indistinctly pointed, with a median and a terminal tooth. The *trochanter*, which is 1·8 as long as wide, is, anteriorly beyond the stalk, moderately convex, and posteriorly is produced into a rather short round protuberance, which together with the fairly high and better-pronounced one of the dorsal surface gives the posterior surface a bigibbose appearance. The *femur* has a fairly long, not well-defined stalk, beyond which it is gradually and distinctly widened towards the middle and then terminally a little narrower again. It is three times as long as wide; the anterior outline, beyond the stalk, is first very slightly convex and then concave, while the posterior is smoothly and gradually convex basally, but almost smooth in the middle, and beyond a trifle convex again. The *tibia*, which has a very long and slender, but not well-defined stalk, is a little shorter, but wider than the femur, and is

2·6 as long as wide; the anterior outline, beyond the stalk, is moderately convex and then terminally a trifle concave, while posteriorly beyond the condylus and insignificant basal elevation it is completely straight and then distally slightly convex. The *chela*, which is 3·3 as long as wide, is scarcely as broad as the trochanter is long; the *hand*, which is about as long as, but 1·4 wider than the tibia, is almost twice as long as broad, about 1·1 wider than deep, and 1·3 as long as the fingers, which are much longer than the hand is wide, and gape a trifle when closed; the lateral outlines are moderately convex, the anterior and the dorsal most distinctly so, and in a less degree the ventral. Both fingers bear anteriorly three *accessory* teeth, while posteriorly the immovable finger has four teeth and the movable finger five. The *number* of "*spots*" is extremely small, as the movable finger does not seem to possess any, in contradistinction to the immovable finger, which anteriorly has two groups of three spots close together and posteriorly only two close together (figs. 25 *b–c*).

Text-fig. 71.



Ch. ellingsenii, sp. n., ♀. Fourth pair of coxæ. × 44.

Coxæ (text-fig. 71).—The second as well as the third pair are distinctly widened out towards the extremity; at the base they become suddenly narrower, especially the second pair. The fourth pair are quadrangular, scarcely widened out towards the extremity, and have the hinder, slightly concave margin well separated from the inner and almost 1·5 longer.

Legs (Pl. XXXI. figs. 25 *d–e*).—The proximal joints are only indistinctly granular. The hairs of the dorsal side are rather short, or short and pointed, with a median and a terminal tooth; the hairs of the ventral side are longer and more or less completely simple. The tarsal "*tactile*" hair was missing in the specimen described, but in another a very long one placed somewhat behind the middle and as long as the distance to the thigh was observed. The legs are extremely long and slender, and the trochantin of the first pair is much deeper than the femur proper, while the tibia is about 1·1 as long as the *tarsus*, which is 5·8 as long as deep; the *femur* of the fourth pair of legs is 3·3 as long as deep, scarcely 1·1 as long as the tibia, and at least twice lower than the tarsus is long.

Colour.—The palps are light or dark reddish brown, and the body is brown.

Measurements.—Cephalothorax 1·035 (0·920); abdomen 2·415 (1·245) mm.

Palps: trochanter 0·552 (0·310); femur 1·012 (0·335); tibia 0·989 (0·375); hand 0·989 (0·529), depth 0·483; finger 0·736 mm.

Leg I.: femur 0·676 (0·175), trochantin 0·144 (0·190); tibia 0·532 (0·114); tarsus 0·486 (0·084) mm.

Leg IV.: femur 0·950 (0·288); tibia 0·874 (0·167); tarsus 0·585 (0·114) mm.

Variation.—The four specimens examined (probably all females) were almost completely alike in all respects, the most important differences being that the colour of the one female (from New Granada) was much darker and that the transverse stripes of another specimen (from Bogota) were more prominent; the accessory teeth and "spots" differ only in mere trivialities. One startling variation, however, was observed, namely, in the position of the tarsal "tactile" hair, for in the two specimens from New Granada this was placed distinctly behind the middle, but in those from Bogota placed beyond the middle.

Material.—I have examined two females of this species from New Granada and two from Bogota (♀?), all four belonging to the British Museum (Keyserling Coll.).

Remarks.—This species seems to be very similar to *Ch. patagonicus* Tullgr. (*cf.* 13. pp. 155–157), but as it has the hand 1·3 instead of as long as the fingers, and narrower instead of much wider than the trochanter is long, and as also minor differences were observed, I do not think it correct to refer it to this species. To *Ch. elegans* Balz. (11. pp. 520–521, pl. 10. fig. 12) it bears also great similarity, but may be distinguished by the shorter hairs of the femur, which is not attenuated and less convex anteriorly, as well as by the less strongly convex outlines of the tibia.

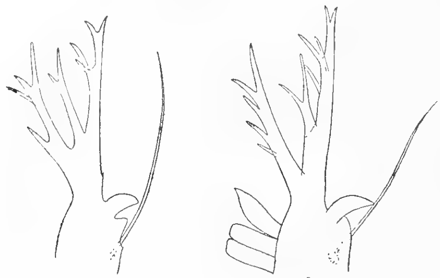
d. Subgroup of Chelifer argentinus Thor.

Flagellum consists of three hairs; galea almost alike in ♂ and ♀. Cephalothorax with or without ocular spots, and with distinct median and indistinct posterior transverse stripe. Tibia of palps with two posterior "tactile" hairs in middle; usual hairs stiff, pointed, and almost simple. "Tactile" hair of tarsus IV. $\frac{1}{4}$–$\frac{1}{5}$ removed from the base; in the middle of tibia a long, slender, completely simple hair.

Ocular spots are generally well developed, but real eyes are never found. The cephalothorax, which is seldom distinctly granular, but generally almost smooth, has the anterior transverse *stripe* broad and fairly distinct, while the posterior is rather indistinct or even wanting. The *abdomen*, which has all its tergites except the first and last one longitudinally divided, has along their hindmost margin a variable number of more or less long, stiff, pointed, and almost simple hairs in addition to a median and a single or two lateral hairs on each side in front of the row, in the median segments at least. The tenth tergite as well as the sternite has a pair of "tactile" hairs, while the eleventh has two. As far as the more detailed arrangement of the hairs is concerned, I refer to the description of *Ch. similis* Balz. and *Ch. argentinus* Thor., as I think that it is the preservation of the specimens only which has made it impossible to find a similar arrangement in all the species of this group. The *genital area* of the male seems to be alike in all the examined species and to be very characteristic. The anterior and posterior plates are of almost equal length, the former having a median concavity fitting into a pronounced convexity on the posterior plate; through the skin accessory glands exactly like those found in *Ch. cimicoides* F. as well as an undivided elongated testis can be seen in transparent specimens.

The *galea* varies from a very simple form with few teeth to a large profusely branched organ; but in neither case is any sexual difference observable (*cf.* text-figs. 72 & 73). The *flagellum* consists always of three hairs. The *palps* are generally polished, and granular only on the anterior surface. In addition to the usual fairly long, stiff, pointed, and not completely simple hairs, very long slender and completely simple hairs,

Text-figs. 72 & 73.



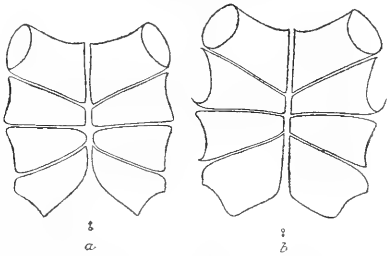
Ch. macrochelatus Töm. Right galea of ♂ and ♀. × 200.

are present, viz., a single ventral hair on the trochanter in the middle; on the femur posteriorly a single hair in the middle and two terminal hairs of which the ventral is the longer; the tibia has two such hairs posteriorly in the middle, one more proximal nearer the ventral margin, and one more dorsal nearer the dorsal margin; the hand has basally one of these hairs posteriorly and another ventrally, and beyond the middle a single ventral hair. The fingers bear in addition to the usual twelve tactile hairs on the immovable finger a single long and slender hair dorsally in the middle, and on the movable finger two beyond the middle. All the above-mentioned hairs were only observable in a few forms, but their fragility taken into consideration, I think we are right in regarding them as constant within this subgroup. The fingers in some species gape considerably in the male, and are provided with a very varying number of accessory teeth, which are, however, always more numerous posteriorly than anteriorly. The number of spots is variable, but is generally great, and anteriorly behind the two basal "tactile" hairs of the immovable finger there are at least a few.

The *coxæ* are generally very similar to those figured of *Ch. argentinus* Thor., and are in some degree sexually different (text-figs. 74 & 75). The *legs* bear, in addition to the usual fairly long stiff hairs, very long and slender, most often completely simple hairs, a single ventral one on the trochanter and trochantin, terminally a single one, not always completely simple, dorsally on the femur, as well as a single one on the tibia, somewhat beyond or behind the middle. The tarsal "*tactile*" hair is $\frac{1}{4}$–$\frac{1}{5}$ removed from the base and about as long as the tarsus. The legs are fairly long and slender;

the femur is not very much longer than the tibia, and distinctly (1·4–2) as low as the femur is deep; the tibia of the first pair is generally 1·2 as long as the tarsus. In two species I have found curiously developed teeth on the claws, the presence of which does not necessarily show that the two species are closely allied (*cf.* below).

Text-figs. 74 & 75.



Ch. argentinus Thor. Coxæ of ♂ and ♀. × 37.

This subgroup is in the main identical with Balzan's "*Lamprochernes* Töm.," with the important exception that those species which he mentions from Asia and Africa must be expelled and be referred to the group of *Ch. birmanicus* Thor., which in external appearance is very similar to the *Ch. argentinus* Thor., but has scarcely any claim to nearer relationship. All the species which I have examined of this group go naturally together; of those which I have not examined I refer without hesitation *Ch. ovatus* Balz. to it, while the position of *Ch. elegans* Balz., *Ch. venezuelanus* Balz., and *Ch. brasiliensis* Dad. is somewhat doubtful. The species of this group fall again into minor divisions: *Ch. communis* Balz. and *Ch. intermedius* Balz. stand closely together; *Ch. nodulimanus* Töm. and *Ch. nitidus* Ell., two species of very different appearance, are closely connected with each other by a number of intermediate forms (*cf.* Ellingsen, 18. p. 6).

As the species of this subgroup are very variable and often difficult to determine, a few words may perhaps be added about the specific characters. In the first place, the sex of a specimen must be taken into account both in description and in examination, as the shape of the palps generally varies considerably in male and female. The trochanteral protuberances are of great importance; the width and the depth of the hand should always be sharply distinguished from each other, and are with profit compared to each other as well as to the length of the hand and finger. The number of accessory teeth and "spots" are of value, but the variations (which are often considerable) should be taken into account. The proportion between the joints of the legs is, of course, of importance.

Synopsis of Species.

a. Claws without teeth.

a^1. Femur of the palps almost 3 as long as wide.

a^2. Trochanter strongly bigibbose. Tibial stalk rather short. Galea with teeth only . . . . 36. *Ch. elegans* Balz.

b^2. Trochanter only strongly gibbose dorsally. Tibial stalk extremely long and slender. Galea branched . . . . 37. *Ch. venezuelanus* Balz.

b^1. Femur of the palps 2·5 or less as long as wide.

a^3. Movable finger with "spots" anteriorly. Femur about 2 as long as wide.

a^4. Hand 1·8 as long as finger, which is shorter than hand wide . . . . 39. *Ch. ovatus* Balz.

b^4. Hand 1·4–1·5 as long as finger, which is at least 1·1 as long as hand wide.

a^5. Tibia less than 2 as long as wide. Chela 2·7 as long as wide. Hand wider than deep. . . . . 41. *Ch. intermedius* Balz.

b^5. Tibia at least 2 as long as wide. Chela 3 as long as wide. Hand at least as deep as wide . . . . 42. *Ch. communis* Balz.

b^3. Movable finger without "spots" anteriorly.

a^6. Hand 1·8 as long as finger, which is shorter than hand is wide . . . . 39. *Ch. ovatus* Balz.

b^6. Hand 1·5 as long as finger.

a^7. Femur as well as tibia scarcely (♂) or about 2 as long as wide . . . . 38. *Ch. subovatus*, sp. n.

b^7. Femur as well as tibia more than 2 as long as wide.

a^8. Finger 1·4 as long as hand wide. Hand not more than 1·2 as long as finger. Tibia of ♂ scarcely produced. Small species.

a^9. Chela 3·3 as long as wide. Hand 1·1 as wide as deep. Finger 1·5 as long as hand wide. Galea with teeth. Tibia 0·647 mm. . . . . . 43. *Ch. nitidus* Ell.

b^9. Chela 3 as long as wide. Hand less than 1·1 as wide as deep. Finger 1·4 as long as hand wide. Galea branched. Tibia 0·815 mm. . . . . . 44. *Ch. similis* Balz., ♂.

b^8. Finger not more than 1·3 as long as hand wide. Larger species. Tibia of ♂ generally produced.

a^{10}. Hand a trifle wider than deep (♀) or scarcely deeper than wide (♂). Granulation of cephalothorax wanting or indistinct. Tibia of ♂ slightly produced.

a^{11}. Smaller species. Long hair on palps. Less branched galea. Tibia 0·828 mm. . . . . . 44. *Ch. similis* Balz., ♀.

b^{11}. Larger species. Moderately long hair on palps. Strongly branched galea. Tibia 1·02 mm. . 45. *Ch. argentinus* Thor.

b^{10}. Hand as deep as wide (♀) or at least 1·3 as deep as wide (♂). Granulation of cephalothorax fairly distinct. Tibia distinctly produced in ♂.
  a^{12}. Finger 1·2 (♀) or 1·05 (♂) as long as hand deep. Tibial protuberance not very long. Fingers gape moderately when closed. Tibia 1·32 mm. . . . . 46. *Ch. macrochelatus* Töm.
  b^{12}. Finger 1·1 shorter than hand deep. Tibial protuberance long and conical. Fingers gape considerably when closed. Tibia 1·91 mm. . 47. *Ch. nodulimanus* Töm., ♂.
c^3. . . . . 40. *Ch. brasiliensis* Dad.
b. Claws of the fourth pair of legs with big median teeth.
  a^{13}. Hand 1·4 as deep as wide and 1·3 as long as finger, which is a little shorter than hand deep. Tibia with long slender stalk and with conical protuberance. Femur exteriorly shaggy, with long slender simple hairs . . . . 48. *Ch. cervus* Balz., ♂.
  b^{13}. Hand 1·1 as wide as deep and 1·5 as long as the finger, which is 1·2 as long as hand deep. Tibia with short stalk and not conically produced. Femur with usual hairs posteriorly . . 49. *Ch. depressimanus*, sp. n., ♀.

36. Chelifer elegans Balz.

1891. *Lamprochernes elegans* Balzan, (11) pp. 520–521, pl. 10. figs. 12–12 *a*.

Cephalothorax has a single transverse *groove* and is minutely granular. *Galea* with short branches. The palps are granular. The *trochanter* is strongly bigibbose; the *femur*, which is 2·9 as long as wide, is posteriorly beyond stalk gradually convex. The *tibia*, which has a rather short and well-defined stalk, is 2·4 as long as wide, and is anteriorly moderately convex; posteriorly, beyond the prominent condylus which is separated by a deep incision from the insignificant basal elevation, it is first almost straight and then moderately convex. The *hand* is 1·4 as wide as tibia and 1·5 as long as the finger, which is 1·3 as long as hand is wide. As none of the usual slender hairs on the palps are observed in Balzan's figure, and as the usual hairs are rather short, we cannot regard the position of this species within the subgroup of *Ch. argentinus* Thor. as secure; a new examination of the palps, but especially of the legs, will be necessary ere the question can be settled. Perhaps it is related to *Ch. ellingsenii*, sp. n., and *Ch. patagonicus* Tullgr.; regarding the differences I refer to the description of these species.—Venezuela.

37. Chelifer venezuelanus Balz.

1891. *Lamprochernes venezuelanus* Balzan, (11) p. 518, pl. 9. figs. 9–9 *a*.

Cephalothorax minutely granular with distinct transverse *stripe*. *Galea* is well-branched. The *trochanter* is strongly produced dorsally; the *femur*, which is 3 as long as wide, is rather gradually convex posteriorly; the *tibia*, which has a very long and slender stalk and is 2·3 as long as wide, is anteriorly slightly convex and posteriorly beyond the elongated basal elevation first concave and then moderately convex. *Hand* is 1·2 as wide as tibia, but 1·1 as long, and 1·4 as long as the finger, which is almost 1·4 as long as hand is wide. The position of this species cannot yet be regarded as secure.—Venezuela.

38. Chelifer subovatus, sp. n. (Plate XXXI. figs. 26 *a–f*.)

Male.

Cephalothorax.—Ocular spots rather indistinct. The cephalothorax, which is somewhat longer than wide, has the anterior broad transverse *stripe* fairly prominent and straight, like the rather indistinct posterior one. The integument is almost smooth or completely so, with rather long hairs.

Abdomen.—The abdomen, which is long and slender, has all the tergites, with the exception of the first and hindmost part of the eleventh, longitudinally divided; the sclerites are smooth and have along the hindmost margin from 12–14 not very long hairs, and in front of the row in the median segments two lateral and a single median hair, as far as could be observed; last segments with "tactile" hairs (*cf.* below).

Antennæ.—The slender and fairly long *galea*, which extends distinctly beyond the terminal hair, has distally about six branches, decreasing towards the end.

Palps (Pl. XXXI. figs. 26 *a–d*).—The palps are only minutely and not very distinctly granular posteriorly in the trochanter and anteriorly in the three following joints. The hairs are fairly long or long; the usual slender and completely simple hairs are partly missing in specimens examined. The *trochanter*, which is 1·6 as long as wide, is anteriorly slightly convex, and posteriorly produced into a short rounded protuberance; dorsally it is prolonged into a deep, somewhat conical and rounded protuberance, and its depth is lower than that of the femur. The *femur* has a short and well-defined stalk, beyond which it is distinctly attenuated. It is scarcely twice as long as wide; the anterior outline is moderately convex and then slightly concave, while the posterior, beyond the stalk, is very abruptly convex and then almost straight; dorsally it is even more suddenly raised and then very slightly convex to the end. The *tibia*, which has a rather short and well-defined stalk, is a little longer and wider than the femur, and it is 1·8 as long as wide; anteriorly it is very strongly convex, almost semicircular in the middle, and scarcely concave terminally; posteriorly, beyond the prominent condylus and low, but fairly distinct, basal elevation, it is almost straight and then terminally distinctly convex; the dorsal outline is only slightly convex, while the ventral is moderately so. The *chela*, which is 2·8 as long as wide, is about 1·1 broader than the trochanter is long; the *hand*, which is a little longer and 1·3 wider than the tibia, is 1·8 as long as wide, about 1·1 wider than deep, and almost 1·4 as long as the fingers, which are almost 1·2 longer than the hand is wide, and scarcely gape when closed; anteriorly the outline is only slightly convex, and so are the dorsal and ventral outlines, while the posterior is moderately so. Anteriorly the immovable finger has four terminal *accessory* teeth and posteriorly seven, while the movable finger has three and ten respectively. The immovable finger has anteriorly four or five "*spots*" behind the basal tactile hairs, and from two to four between and beyond (figs. 26 *c–d*), and posteriorly about four beyond the basal hairs, while the movable finger has no spots either anteriorly or posteriorly.

Coxæ.—The fourth pair are of a somewhat triangular appearance, as the angle between the inner and the hinder margin is very obtuse; the former of these margins is at least twice as long as the latter.

Legs.—The hairs are fairly long, and in addition to the usual slender and completely simple hairs, one as long as the terminal hair of the femur is placed dorsally just behind the tip of the femur of the fourth pair of legs. The legs are rather short and clumsy; the tibia of the first pair of legs is 1·2 as long as the *tarsus*, which is 4·4 as long as deep; the *femur* of the fourth pair of legs is 2·4 as long as deep, 1·1 as long as the tibia, and 1·4 lower than the tarsus is long.

Colour.—The palps and the anterior portion of the cephalothorax are reddish brown, while the rest of the body is brown or yellowish.

Measurements.—Cephalothorax 0·805 (0·690); abdomen 1·840 (1·035) mm.

Palps: trochanter 0·437 (0·276); femur 0·713 (0·368); tibia 0·736 (0·405); hand 0·782 (0·483), depth 0·437; finger 0·575 mm.

Leg I.: femur 0·517 (0·175), trochantin 0·091 (0·182); tibia 0·410 (0·118); tarsus 0·334 (0·076) mm.

Leg IV.: femur 0·669 (0·278); tibia 0·608 (0·164); tarsus 0·395 (0·106) mm.

Female.

Abdomen.—The abdomen is much longer and more slender.

Palps (Pl. XXXI. figs. 26 *e–f*).—The dorsal protuberance of the *trochanter* is somewhat lower and more rounded. The *femur*, which is distinctly twice (2·1) as long as broad, appears much more slender and has the posterior as well as the dorsal outlines more evenly convex beyond the stalk. The *tibia*, which is just twice as long as broad, appears much more slender and has the anterior as well as the posterior outlines less distinctly convex. The *chela* is 2·7 as long as wide, and the *hand* as well as the fingers are shorter and more clumsy than in the male; hand is namely 1·4 broader than tibia, 1·6 longer than wide, distinctly 1·1 wider than deep, and 1·5 longer than the fingers, which are only 1·1 longer than the hand is wide.

Coxæ.—The fourth pair of trapezoidal appearance, as the angle between the interior and posterior margins is much better defined; the posterior margin is even shorter.

Legs.—The legs are perhaps a little more slender, the tarsus of the first pair being, for instance, 4·5 as long as deep.

Measurements.—Cephalothorax 0·805 (0·690); abdomen 2·530 (1·035) mm.

Palps: trochanter 0·460 (0·276); femur 0·759 (0·355); tibia 0·782 (0·391); hand 0·851 (0·510), depth 0·460; finger 0·575 mm.

Leg I.: femur 0·547 (0·182), trochantin 0·091 (0·190); tibia 0·433 (0·118); tarsus 0·357 (0·079) mm.

Leg IV.: femur 0·725 (0·296); tibia 0·623 (0·167); tarsus 0·418 (0·114) mm.

Variation.—A single male from the same locality as the typical one differed by the very prominent basal elevation of the tibia.

Material.—I have examined four specimens (2 ♂ and 2 ♀) from Argentine, 2 specimens (♂ and ♀?), collected by Dr. W. Sörensen under bark at Riacho dell' Oro, and two others (♂ and ♀?), sifted by Dr. Meinert, at La Moka, in the month of August.

Remarks.—This species seems to be nearly related to *Ch. ovatus* Balz., but differs by its much smaller size, by the tibia of the palps, which is less strongly convex, and by the hand, which is only about 1·5 not 1·8 as long as the fingers, which are distinctly longer, not shorter, than hand is wide. From *Ch. argentinus* Thor. and other species, in which the movable finger of the palps has no spots anteriorly, it differs by less slender palps. From *Ch. communis* Balz., as well as from *Ch. intermedius* Balz., it differs by the absence of spots on the movable finger; from the former of these also by the tibia, which has a short stalk and is only twice or less as long as broad, and from the latter by the tibia of the male, which is not produced anteriorly and dorsally.

39. Chelifer ovatus Balz.

1891. *Lamprochernes ovatus* Balzan, (11) p. 519, pl. 9. figs. 10–10 *a*.

This large species may perhaps most easily be recognised by the following structures: the *galea* is moderately branched; the *femur* of the palps is about 2·3 as long as wide; the *tibia*, which has both lateral outlines equally and distinctly convex, is twice as long as wide, and 1·3 narrower than the *hand*, which is as wide as the finger is long and 1·8 longer.—Venezuela.

40. Chelifer brasiliensis Dad.

1889. Daday, (9) pp. 23–24, tab. ii. figs. 5 & 15.

Cephalothorax smooth and polished, with single transverse *stripe*; the *galea* is well branched; the *tibia* is rather suddenly convex anteriorly and shorter than *hand*, which is about as long as finger. A re-examination of the typical species is necessary, as the description is too imperfect to be of any value.—Brazil.

41. CHELIFER INTERMEDIUS Balz. (Plate XXXI. figs. 27 *a–d.*)

1891. *Lamprochernes intermedius* Balzan, (11) pp. 515–516, pl. 9. figs. 6–6 *a.*
1902. *Chelifer rotundatus* Ellingsen, (15) pp. 151–152.
1905. *Chelifer intermedius* Ellingsen, (18) pp. 8–10.
1907. *Chelifer intermedius* Tullgren, (23) pp. 52–53, figs. 13 *a–f.*

Male.

Cephalothorax.—Ocular spots fairly distinct. The cephalothorax, which is somewhat longer than wide, has the anterior, almost straight, transverse *stripe* broad and fairly prominent, in contradistinction to the rather indistinct posterior one. The integument is smooth, somewhat polished in front of the median stripe, and provided with fairly long hairs.

Abdomen.—The abdomen, which is fairly long and slender, has all the tergites, except the first and the last, longitudinally divided; the sclerites are almost smooth and have along their hindmost margin in the median segments from 14–16 long and moderately long hairs, in addition to two lateral and a single median one on each side in front of the row. Number of "tactile" hairs on last segments is probably as in *Ch. similis* Balz., but could not be investigated in the specimen examined.

Antennæ.—The *galea,* which is fairly long and slender, extends distinctly beyond the terminal hair and has from 6–10 branches differing in length.

Palps (Pl. XXXI. figs. 27 *a–d*).—Anterior surfaces of the joints minutely and not very distinctly granular. The hairs are long or even very long. The *trochanter,* which is about 1·5 as long as wide, is slightly convex anteriorly, and posteriorly is produced into a short basal protuberance; dorsally it is prolonged into a deep conical and somewhat rounded protuberance, and its depth is less than that of the femur. The *femur* has a short and well-defined stalk, beyond which it tapers towards the extremity. It is about 1·9 as long as wide; the anterior outline is slightly convex and then concave, while the posterior beyond the stalk is very abruptly convex and then almost straight; dorsally it is somewhat more regularly, though more strongly, convex beyond the stalk, and then slightly convex, most raised towards the middle, from which it gradually slopes towards the end. The *tibia,* which has a rather short and well-defined stalk, is a little longer and wider than the femur, and is 1·8 as long as wide; anteriorly it is very strongly convex, almost semicircular in the middle and then terminally very slightly concave; posteriorly beyond the rather small condylus and low ill-defined basal elevation it is almost straight and then strongly convex; the ventral margin is gradually and strongly convex in contradistinction to the dorsal, which is somewhat produced in the middle (figs. 27 *b–d*). The *chela,* which is about 2·6 as long as wide, is about 1·3 as broad as the trochanter is long; the *hand,* which is distinctly longer and 1·3 wider than the tibia, is 1·6 as long as wide, only a trifle wider than deep, and 1·5 as long as the fingers, which do not gape when closed and are scarcely 1·1 as long as the hand is wide; the hand is moderately convex anteriorly and dorsally, but only slightly so posteriorly and ventrally. Anteriorly the fingers bear only a few *accessory* teeth distally (fig. 27 *c*) and posteriorly about ten. The immovable finger has anteriorly from 11–18 "*spots*" arranged somewhat differently in the various specimens, in two groups (*cf.* fig. 27 *c*), and the movable finger has from three to five spots in the basal half; posteriorly the spots in the single specimen examined are placed as shown in figure (fig. 27 *d*).

Coxæ.—The fourth pair are somewhat triangular, as the hinder and inner margins, which are of about equal length, are not well distinguished from each other, the angle between being very obtuse.

Legs.—The hairs are moderately long. The legs are rather short and clumsy; the tibia of the first pair of legs is 1·2 as long as the *tarsus*, which is four times as long as deep; the *femur* of the fourth pair of legs is 2·3 as long as deep, 1·1 longer than the tibia, and 1·6 lower than the tarsus is long.

Colour.—The palps are dark reddish brown; the cephalothorax and the abdomen brownish.

Measurements.—Cephalothorax 0·805 (0·735); abdomen 2·530 (0·966) mm.

Palps: trochanter 0·395 (0·265); femur 0·690 (0·368); tibia 0·725 (0·391); hand 0·820 (0·529), depth 0·515; finger 0·555 mm.

Leg I.: femur 0·471 (0·175), trochantin 0·084 (0·179); tibia 0·357 (0·114); tarsus 0·304 (0·076) mm.

Leg IV.: femur 0·588 (0·258); tibia 0·532 (0·144); tarsus 0·365 (0·095) mm.

Variation.—The specimen which Mr. Ellingsen kindly sent me for examination differed by the less slender abdomen and more powerful palps, but scarcely in any character of importance.

Female.

Cephalothorax &c.—The second transverse stripe is obsolete; the abdomen in the specimen examined is rather clumsy, being dilated with eggs. The arrangement of the hairs is in the main as in *Ch. similis* Balz. The *galea* of the antennæ is almost exactly similar to Balzan's figure 8 *a*, pl. 9.

Palps.—The *trochanter* has the dorsal protuberance somewhat lower and more rounded and is 0·7 as long as wide. The *femur*, which is comparatively more long and slender, viz. 2·1 as long as wide, is posteriorly as well as dorsally less abruptly convex. The *tibia*, which is about 1·9 as long as wide, is anteriorly less strongly convex, and has posteriorly the condylus as well as the basal elevation more prominent. The *chela*, which is 2·7 as long as wide, is only 1·1 broader than the trochanter is long; the *hand* is 1·7 longer than deep and 1·1 wider than deep.

Coxæ.—The fourth pair are trapezoidal, at least as long as broad, with the inner margin well separated from the much shorter hinder one.

Legs.—The *femur* of the fourth pair of legs is 2·5 as long as deep and 1·5 lower than the tarsus long.

Colour.—The palps are lighter brown.

Measurements.—Cephalothorax 0·920 (0·805); abdomen 3·5 (2·00) mm.

Palps: trochanter 0·552 (0·322); femur 0·920 (0·437); tibia 0·943 (0·483); hand 1·035 (0·621), depth 0·565; finger 0·690 mm.

Leg I.: femur 0·684 (0·220), trochantin 0·114 (0·236); tibia 0·532 (0·137); tarsus 0·433 (0·106) mm.

Leg IV.: femur 0·836 (0·334); tibia 0·760 (0·182); tarsus 0·509 (0·129) mm.

Material.—Of this species I have examined four specimens (3 ♂ and 1 ♀ ?) from Rio Janeiro and a male from Lagoa Santa, collected by Reinhardt; a male collected in the month of December at Los Trinchéras, and the female described collected on a road at La Guayra, Caracas, in the month of July by Dr. Meinert. This species has previously been recorded from Venezuela, Ecuador, and Brazil.

Remarks.—That the described males, which I had the good luck to be able to compare with a specimen determined by Mr. Ellingsen, ought to be referred to *Ch. intermedius* Balz., I regard as certain in spite of their much smaller size; they differ from Ellingsen's description (18. p. 9) by the femur, which is scarcely 1·2 instead of 1·5 deeper than wide. I think that the female mentioned is most naturally referred to the same species in spite of the differences enumerated above.

42. Chelifer communis Balz. (Plate XXXI. figs. 28 *a–g*.)

1880. Balzan, (10) pp. 416–417, tav. xiii. figs. 4–4 *b*.
1891. Balzan, (11) p. 548.
1902. ? Ellingsen, (15) pp. 167–168.
1905. ? Ellingsen, (18) p. 10.
1905. ? Ellingsen, (19) p. 324.

Male.

Cephalothorax.—*Ocular* spots not very distinct. The cephalothorax, which is distinctly longer than wide, has two broad, almost straight, transverse *stripes*, of which the anterior is the more prominent. The integument is smooth and the hairs are fairly long.

Abdomen.—The abdomen, which is exceedingly long and slender, has all the tergites with the exception of the first and the last longitudinally divided; the sclerites are smooth and have along their hindmost margin about 14 hairs in addition to generally two lateral and a single median one in front of the row on each side, at least in the median segments; the arrangement of "tactile" hairs probably as in variation (*cf.* below).

Antennæ.—The rather short *galea*, which extends only slightly beyond the terminal hair, is bifurcate and provided with about six branches, arranged from base to the tip.

Palps (Pl. XXXI. figs. 28 *a–c*).—The palps are smooth except on the anterior surfaces, which are minutely and not very distinctly granular. The hairs are fairly long or long. The *trochanter*, which is 1·6 as long as wide, is almost straight anteriorly, and posteriorly is produced into a short basal protuberance; dorsally it is prolonged into a very deep, almost triangular, somewhat blunt process, and its depth is only a little less than that of the femur. The *femur* has a short and well-defined stalk, beyond which it is slightly attenuated towards the extremity. It is 1·9 as long as wide and distinctly (1·1) deeper than wide; the anterior outline beyond the stalk is first slightly convex and then a trifle concave, while the posterior, beyond the stalk, is very abruptly convex and then slightly so or almost straight; dorsally it is more suddenly and more strongly convex beyond the stalk, and then slightly convex, most raised towards the middle, from which it slopes towards the end. The *tibia*, which has a long, slender, fairly well-defined stalk, is longer but scarcely wider than the femur, and is distinctly twice as long as broad; anteriorly it is distinctly convex and then terminally a trifle concave, while posteriorly, beyond the fairly prominent condylus and not very pronounced basal elevation, it is first almost straight and then distinctly convex; the ventral margin is regularly and strongly convex, while the dorsal just beyond the stalk is rather suddenly, but not very distinctly, convex for a short distance and then almost straight, sloping towards the end. The *chela*, which is almost three times as long as wide, is about 1·1 as broad as the trochanter is long; the *hand*, which is as long as, but almost 1·3 as wide as the tibia, is almost 1·4 as long as wide, scarcely 1·1 deeper than wide, and is scarcely 1·3 as long as the fingers, which are 1·3 as long as the hand is wide, but 1·2 as long as deep, and which gape a trifle when closed; the anterior outline is moderately convex, but the posterior as well as the dorsal and ventral ones are only slightly convex. Anteriorly both fingers bear about three *accessory* teeth towards the end (*cf.* fig. 28 *c*), while the number is about ten posteriorly on the immovable as well as on the movable finger. The immovable finger has anteriorly, behind and between the basal "tactile" hairs, about twelve spots, and beyond about five, while the movable finger has eight spots in the basal two-thirds (*cf.* fig. 28 *f*); posteriorly the immovable finger has beyond the basal tactile hairs six and the movable finger four spots.

Coxæ.—The fourth pair are more quadrangular than triangular and have the hinder and inner margins, which are well limited from each other, of almost equal length.

Legs.—The hairs are moderately long. The legs are moderately long and slender; the tibia of the first pair of legs is 1·1 as long as the *tarsus*, which is 4·7 as long as deep; the *femur* of the fourth pair of legs is 2·6 as long as deep, 1·2 as long as the tibia, and 1·6 lower than tarsus long.

Colour.—The palps and head are reddish brown, the rest is pale brown or yellowish.

Measurements.—Cephalothorax 0·920 (0·805); abdomen 2·760 (0·989) mm.

Palps: trochanter 0·460 (0·305); femur 0·805 (0·414); tibia 0·851 (0·414); hand 0·851 (0·515), depth 0·552; finger 0·667 mm.

Leg I.: femur 0·585 (0·185), trochantin 0·106 (0·198); tibia 0·464 (0·129); tarsus 0·426 (0·091) mm.

Leg IV.: femur 0·760 (0·296); tibia 0·646 (0·175); tarsus 0·486 (0·114) mm.

Female.

Cephalothorax.—The posterior stripe is obsolete or very indistinct.

Palps (Pl. XXXI. figs. 28 *d–g*).—The dorsal protuberance of the *trochanter* is much lower and more rounded (fig. 28 *e*). The *femur*, which is distinctly attenuated towards the extremity, is 2·1 as long as wide; it is less abruptly convex posteriorly as well as dorsally. The *tibia* has the stalk less slender than in the male, and the dorsal and ventral outlines are less curved. The *chela* is less slender, being scarcely three times as long as wide; the hand is only 1·6 as long as wide, only a trifle deeper than wide, and 1·4 as long as the fingers, which are 1·2 as long as the hand is wide. The variations in number and arrangement of *accessory* teeth and "*spots*," which are observed when comparing the figures and previous description, are scarcely greater between males and females than between different specimens of the same sex (*cf.* figs. 28 *f–g*).

Coxæ.—The fourth pair are very similar to those of the male, the inner margin being only about twice as long as the hinder.

Legs.—The *tarsus* of the first pair is only four times as long as deep.

Measurements.—Cephalothorax 0·805 (0·690); abdomen 3·2 (1·61) mm.

Palps: trochanter 0·391 (0·253); femur 0·690 (0·322); tibia 0·690 (0·335); hand 0·713 (0·437), depth 0·460; finger 0·529 mm.

Leg I.: femur 0·441 (0·144), trochantin 0·076 (0·160); tibia 0·350 (0·099); tarsus 0·319 (0·076) mm.

Leg IV.: femur 0·638 (0·236); tibia 0·509 (0·140); tarsus 0·388 (0·091) mm.

Variation.—♂. Several males collected by Dr. Meinert in La Moka differ from the described one from Bahia by the more slender palps, viz. the femur, which is 2·1 as long as wide, is less abruptly convex posteriorly as well as dorsally; the tibia is 2·2 as long as wide; the other joints also differ in a slight degree, but with regard to these I refer to the measurements. The *legs* are in a remarkable degree more slender, the *tarsus* of the first pair being at least five times as long as deep, and the *femur* of the fourth pair being almost three times as long as deep and 1·7 lower than the tarsus is long. While almost all the *hairs* were missing in the described male, this well-preserved specimen has them well-developed and their number appeared to be greater, viz. from 14–18 along the hindmost margin in addition to two lateral and a single median one in front of the row on each side; a few of the hairs along the margin are sometimes placed a little in front of it; this is especially the case with a very long and slender hair, which in the hindmost segments becomes a "tactile" hair exactly as in *Ch. similis* Balz., to which I refer. The *measurements* are as follows:—Cephalothorax 0·805 (0·690); abdomen 1·040 (0·874) mm.

Palps: trochanter 0·483 (0·299); femur 0·805 (0·368); tibia 0·851 (0·391); hand 0·851 (0·529), depth 0·552; finger 0·647 mm.

Leg I.: femur 0·585 (0·182), trochantin 0·114 (0·196); tibia 0·456 (0·122); tarsus 0·418 (0·080) mm.

Leg IV.: femur 0·798 (0·281); tibia 0·669 (0·160); tarsus 0·479 (0·110) mm.

♀. A female from the same locality as the above-mentioned male differed from the described female in the following respects. The size is much greater; the shape of and the proportion between the joints of the palps are almost exactly alike, the only differences worth mentioning being, that the *tibia* is both longer and wider than the femur, and that the *hand* is scarcely deeper than wide. In contradistinction to the palps, the legs are much longer and more slender, the *tarsus* of the first pair of legs being almost five times as long as deep, and the *femur* of the fourth pair being 2·7 as long as deep and 1·7 lower than the tarsus is long.

The *measurements* are the following:—Cephalothorax 0·920 (0·805); abdomen 4·25 (1·75) mm.

Palps: trochanter 0·506 (0·299); femur 0·828 (0·391); tibia 0·897 (0·425); hand 0·989 (0·575), depth 0·575; finger 0·690 mm.

Leg I.: femur 0·623 (0·185), trochantin 0·114 (0·205); tibia 0·494 (0·135); tarsus 0·441 (0·090) mm.

Leg IV.: femur 0·836 (0·312); tibia 0·722 (0·175); tarsus 0·494 (0·114) mm.

Material.—Of this species I have examined a number of specimens, of which only a few are completely similar to those described, most agreeing with the variation. The Danish 'Galathea' Expedition brought home from Bahia the described male and female, the latter carrying a bundle of eggs; Professor Reinhardt collected in Rio Janeiro a single somewhat larger female, which had the tarsus of the first pair of legs 4·4 as long as deep, and the vulva, wide open, showing two remarkable bodies within. In Venezuela Dr. Meinert from August to January sifted ten specimens (6 ♀ and 4 ♂) of very different size, mentioned above under variation; among these a female with a bundle of eggs in the month of December. From New Granada a single female was examined (Keys. Coll.). Mr. H. H. Smith collected a single female with a bundle of eggs, in the Old Botanical Garden, Kingstown, Island of St. Vincent, in the month of October in rotten wood, 500 ft., and three females, carrying bundles of embryos, each bundle like a fruit of a Malva, in Bornwood Valley, near Kingstown, 800 ft., Island of St. Vincent, under the bark of rotten log.

This species has previously been mentioned by Balzan from Paraguay and Brazil (Matto Grosso), and by Ellingsen from Argentine, Uruguay, Paraguay, and different localities in Brazil.

Remarks.—The small female described from Bahia is completely like Balzan's description as far as it goes, unimportant trivialities in the structure of the galea and less slender femur of palps excepted; certainly it would not be natural to refer the described male to another species in spite of its larger size, as the differences in the palps and partly the legs are of only sexual importance, especially as they are from the same locality. The difference in shape and in the length of the tarsus of the first pair of legs between the female from Bahia and those from La Moka &c. is certainly great; but as specimens are found intermediate in size and partly in length of the tarsus I. (in ♀ from Rio Janeiro 4·4 as long as deep), and as the males from the different localities are even more similar in most respects, I do not think it right to establish a new species.

A single badly preserved male, one of Ellingsen's specimens, differed in several respects from the above; the palps are much larger—tibia, for instance, 1·012 (0·483),—with the tibia almost produced anteriorly (*cf.* Pl. XXXI. fig. 28 *h*) and with the dorsal tubercle of the trochanter much lower and of another shape; the fingers gape moderately when closed and the movable one had no spots anteriorly. On full consideration I am convinced that the examined specimen must be regarded as belonging to another species; but as only one badly preserved specimen was at my disposal, I do not wish to describe it as a new species, but refer to Ellingsen's description (15. pp. 167–168), in which he writes "C'est avec quelque doute que j'ai rapporté cette forme au *Chelifer communis* Balz." His identification of the specimens from Brazil with *Ch. communis* Balz. was certainly justified, but I scarcely think that the "very small" specimens from Argentine (1905, 18. p. 10) are correctly referred to the same species as the large ones from Brazil. It will only be possible to settle the question of the geographical distribution of these two (three?) species and the correct limitation of *Ch. communis* Balz. by the examination of a very large amount of material.

This species differs from *Ch. intermedius* Balz., chiefly by the tibia, which has a longer and more slender stalk and is at least twice as long as broad, and by the hand, which is wider than deep; the male differs besides by the somewhat triangularly shaped and pointed dorsal process of the trochanter. From the following species, as well as from *Ch. subovatus*, sp. n., it differs by less slender palps and the movable finger, which has "spots" anteriorly.

43. Chelifer nitidus Ell. (Plate XXXI. figs. 29 *a–b*.)

1902. Ellingsen, (15) pp. 155–156.

1905. Ellingsen, (19) p. 324.

Female.

Cephalothorax &c.—The smooth cephalothorax, which is somewhat longer than wide, with fairly distinct ocular spots, has two almost straight transverse *stripes*, of which the very broad anterior one is much the more prominent. Abdomen has along the hindmost margin of each tergite about twelve hairs in addition to a single lateral and a median one in front of the row; the "tactile" hairs are arranged as in *Ch. similis* Balz.

Antennæ.—The very slender *galea*, which extends distinctly beyond the terminal hair, being almost twice as long as the latter, has about five teeth decreasing in length from the base to the tip.

Palps (Pl. XXXI. figs. 29 *a–b*).—The palps are smooth and polished, with very slender hairs. The *trochanter*, which is 1·5 as long as wide, is slightly convex anteriorly and posteriorly slightly produced; dorsally it is prolonged into a low rounded protuberance. The *femur* has a short, well-defined stalk, beyond which it is scarcely attenuated towards the end. It is 2·4 as long as wide; the anterior outline is very slightly convex and then concave, while the posterior, beyond the stalk, is not very abruptly convex, and then almost straight; the dorsal line, beyond the stalk, is moderately convex and then very slightly so. The *tibia*, which is as long as and a little wider than the femur, has a short, not very well-defined stalk and is 2·2 as long as wide; anteriorly it is moderately convex and then a trifle concave, while posteriorly, beyond the not very prominent condylus and almost obsolete basal elevation, it is almost straight and then slightly convex; the dorsal as well as the ventral outlines are slightly convex. The *chela*, which is 3·3 as long as wide, is about 1·1 broader than the trochanter is long; the *hand*, which is a little longer and 1·4 wider than the tibia, is 1·7 as long as wide, scarcely 1·1 as wide as deep, and 1·2 as long as the fingers, which are 1·5 longer than the hand is wide and do not gape when closed; the anterior outline is moderately convex, the posterior as well as the dorsal and ventral areas are only slightly so. Anteriorly the immovable finger has two *accessory* teeth, while the movable has a single one only; the former of the fingers has anteriorly about eleven "*spots*," arranged as shown in figure (*cf.* above).

Coxæ &c.—The fourth pair are almost trapezoidal, with the inner margin about 1·5 as long as the hinder, and with the obtuse angle between them not well defined. The legs appear to be long and slender, but could not be thoroughly investigated in the single specimen which was at my disposal.

Colour.—Palps light reddish brown.

Measurements.—Cephalothorax 0·736 (0·621); abdomen 2·30 (1·38) mm.

Palps: trochanter 0·345 (0·230); femur 0·647 (0·265); tibia 0·647 (0·285); hand 0·713 (0·400), depth 0·368; finger 0·598 mm.

Material.—By the kindness of Mr. Ellingsen I have been able to examine one of his original specimens (♀); the species has only been collected in Ecuador.

Remarks.—For several details I refer to Mr. Ellingsen's description. This species is well defined from the other species of this group by its very minute size, and slender palps with fingers only a little shorter than the hand.

44. Chelifer similis Balz. (Plate XXXI. figs. 30 *a–f*.)

1891. *Lamprochernes similis* Balzan, (11) p. 517, pl. 9. figs. 8–8 *a*.

Male.

Cephalothorax.—Large distinct *ocular* spots found. The cephalothorax, which is distinctly longer than wide, has two transverse *stripes*, of which the anterior almost straight one is very broad and prominent, while the posterior is slightly curved forwards in the middle and not very distinct. The integument is smooth or almost smooth in the middle, but laterally minutely and not very distinctly granular, and appears polished in front of the anterior stripe; the hairs are moderately long.

Abdomen.—The abdomen, which is fairly long and slender, has all the tergites, with the exception of the first and the eleventh, longitudinally divided. The almost smooth tergites have along the hindmost margins from 14–18 *hairs*, which in the same segment vary from rather short, with a few distal teeth, to very long, almost simple ones, but as a whole increase in length towards the end of the abdomen; in addition to these hairs, a long median as well as a single lateral hair (seldom two) on each side are observed. One of the hairs in the row, which already in the fourth tergite is conspicuous by its length, increases in length and is gradually placed somewhat more in front of the marginal row, towards the tip of the abdomen, so that it becomes in the tenth tergite a completely simple "tactile" hair, placed distinctly in front of the row. The eleventh tergite bears two pairs of "tactile" hairs, like the one above mentioned exceedingly long and slender; the corresponding sternite bears two and the tenth only a single pair of these hairs.

Antennæ.—The fairly long and slender *galea*, which extends very much beyond the terminal hair, is bifurcate from the middle, each branch with from 2–6 teeth, almost exactly as figured by Balzan (pl. 9. fig. 8 *a*).

Palps (Pl. XXXI. figs. 30 *a–f*).—The palps are almost smooth, only the trochanter being rather indistinctly granular posteriorly, the femur minutely, but fairly distinctly so anteriorly, and the tibia, as well as the hand at the base of finger, not very distinctly granular anteriorly; the hairs are long or very long. The *trochanter*, which is about 1·5 as long as wide, is anteriorly slightly convex, and posteriorly produced into a rather low rounded protuberance; dorsally it is prolonged into a deep, conical, somewhat rounded protuberance; the trochanter is much deeper than wide and even deeper than the femur. The *femur* has a short and fairly well-defined stalk, beyond which it is scarcely attenuated towards the end. It is about 2·3 longer than wide; the anterior outline is very slightly convex and then concave, while the posterior, beyond the stalk, is not very abruptly convex and then almost straight; dorsally it is rather suddenly convex beyond the stalk, then gradually convex, not gradually sloping to the tip, but terminally with a slightly marked concavity. The *tibia*, which has a fairly long and not very well-defined stalk, is as long as, but somewhat wider than, the femur and is scarcely 2·1 as long as wide; anteriorly, beyond the stalk, it is moderately convex and then a trifle concave, while posteriorly, beyond the not very prominent condylus and long, not well-defined basal elevation, it is almost straight, and then terminally moderately convex; the ventral outline is moderately convex, while the dorsal is very slightly so, but with the antero-dorsal surface slightly produced (*cf.* figs. 30 *d–e*). The *chela*, which is distinctly three times as long as wide, is scarcely 1·1 as broad as the trochanter is long; the *hand*, which is a little longer than, but 1·3 as wide as the tibia, is 1·6 as long as wide, a trifle deeper than wide, and scarcely 1·2 longer than the fingers, which are 1·4 as long as the hand is wide and gape slightly when closed; the anterior outline is moderately convex, the posterior and dorsal are slightly so, and the ventral is almost straight. The immovable finger has anteriorly five *accessory* teeth and the movable one three, while both fingers posteriorly possess about 15 accessory teeth (*cf.* figs. 30 *e–f*). Anteriorly the immovable finger has from 5–16 "*spots*" in two groups (fig. 30 *e*) and posteriorly five in a longitudinal row, while the movable finger has only two posteriorly (fig. 30 *f*).

Coxæ.—*Cf.* description of following species and text-fig. 74 (p. 291).

Legs.—The hairs are long. The legs are long and slender; the tibia of the first pair of legs is about 1·1 as long as the *tarsus*, which is 4·6 as long as deep; the *femur* of the fourth pair of legs is 2·9 as long as deep, a trifle longer than the tibia, and only half as deep as the tarsus is long.

Colour.—The palps are light reddish brown, the cephalothorax is somewhat darker brown, and the abdomen again paler brown.

Measurements.—Cephalothorax 0·966 (0·805); abdomen 2·070 (1·035) mm.

Palps: trochanter 0·483 (0·322); femur 0·805 (0·345); tibia 0·815 (0·391); hand 0·851 (0·515), depth 0·529; finger 0·736 mm.

Leg I.: femur 0·555 (0·180), trochantin 0·091 (0·190); tibia 0·448 (0·114); tarsus 0·403 (0·088) mm.

Leg IV.: femur 0·684 (0·240); tibia 0·669 (0·140); tarsus 0·471 (0·103) mm.

Female.

Palps.—The *trochanter* is dorsally prolonged into a rather low rounded protuberance. The *femur*, which is about 2·4 as long as wide, is more gradually convex beyond the stalk posteriorly and so it is dorsally without terminal concavity. The *tibia*, which is almost 2·3 as long as broad, has not the antero-dorsal surface produced. The *hand*, which is 1·4 as wide as the tibia, is 1·8 longer than wide, a trifle wider than deep, and 1·3–1·4 longer than the fingers, which are distinctly 1·3 as long as the hand is wide, and which do not gape when closed. The number of *accessory* teeth is somewhat smaller than in the male, while the "*spots*" do not provide any characters of interest.

Coxæ.—The fourth pair are very similar to those of *Ch. argentinus* Thor. (*cf.* text-fig. 75), being somewhat trapezoidal with the inner margin almost twice as long as the hinder.

Legs.—The legs are perhaps even longer, with the *tarsus* of the first pair 4·7 as long as deep, and the *femur* of the fourth pair scarcely half as deep as the tarsus is long.

Measurements.—Cephalothorax 0·966 (0·805); abdomen 2·645 (1·265) mm.

Palps: trochanter 0·460 (0·310); femur 0·805 (0·335); tibia 0·828 (0·368); hand 0·920 (0·515), depth 0·506; finger 0·667 mm.

Leg I.: femur 0·570 (0·190), trochantin 0·091 (0·205); tibia 0·464 (0·114); tarsus 0·418 (0·089) mm.

Leg IV.: femur 0·715 (0·247); tibia 0·705 (0·144); tarsus 0·502 (0·110) mm.

Abnormality.—The hindmost segments of the described male show dorsally an abnormal structure, similar to that which I have described in *Ch. javanus* Thor. (31. p. 137, pl. viii. fig. 1 *a*), though of a less complicated structure. The left exterior fourth of the tenth and the eleventh tergites are laterally completely fused without a trace of limitation between; the two tergites are consequently only distinguished from each other in the right three-fourths; the arrangement of the hairs on the left is somewhat irregular, and the longitudinal line of the tenth tergite is directed obliquely backwards towards the left.

Material.—Of this species Dr. Meinert sifted six specimens (2 ♂ and 4 ♀, one with a bundle of eggs) in the month of August at La Moka, and a single female (without date) as well as a single male at Caracas in the month of July. Balzan's specimens are from the Amazons.

Remarks.—The identification of this species with Balzan's species I regard as certain, in spite of its larger size and slightly different proportions of the joints of the palps. From *Ch. nitidus* Ell. it differs by larger size, shorter fingers, and bigibbose trochanter; as regards the differences from *Ch. argentinus* I refer to that species.

45. Chelifer argentinus Thor. (Plate XXXI. figs. 31 *a–f*; text-figs. 74–77.)

1877. Thorell, (3) p. 216.
1888. *Ch. capreolus* Balzan, (7) Pug. iii. pl. 2. figs. 1–4.
1890. Balzan, (10) pp. 414–415, tav. xiii. figs. 3–3 *b*.
1891. *Lamprochernes argentinus* Thor., Balzan, (11) pp. 516–517, pl. 9. fig. 7.
1905. Ellingsen, (17) p. 1.
1905. Ellingsen, (18) pp. 6–8.
1905. Ellingsen, (19) p. 324.
1907. Tullgren, (23) pp. 51–52, figs. 12 *a–f*.

Male.

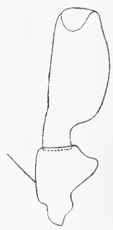
Cephalothorax.—Large *ocular* spots fairly distinct. The cephalothorax, which is distinctly longer than wide, has the anterior transverse *stripe* fairly distinct and slightly curved backwards in the middle, while the almost obsolete or rather indistinct posterior one is slightly curved forwards. The integument is polished, and either completely smooth or very minutely granular, at least in front of the median transverse stripe; the hairs are rather short.

Abdomen.—The long and slender abdomen has all the tergites with the exception of the first and the eleventh more or less distinctly divided by a fine longitudinal line. The tergites have their sclerites rather polished and completely smooth or slightly shagreened, and the median ones have along their hindmost margins at least 16 moderately long hairs in addition to a single median and generally two lateral ones in front of the row; the arrangement and number of the tactile hairs are as in the preceding species (*cf.* above).

Antennæ.—The *galea*, which extends very much beyond the terminal hair, is moderately long and bifurcate, each branch with a number of ramifications.

Palps (Pl. XXXI. figs. 31 *a–b*; text-fig. 76).—The palps are smooth, or almost so, and polished, except the dorsal protuberance of the trochanter and at least the anterior surface of the femur and tibia, which are minutely granular; the hairs are generally long. The *trochanter*, which is 1·6 as long as wide, is anteriorly slightly convex and posteriorly produced into a basal, rounded, and fairly prominent tubercle; dorsally it is prolonged into a deep, somewhat conical, and obtusely-pointed protuberance, which, as shown in text-figure 76, has rather a peculiar shape and has the point directed upwards and towards the extremity; the trochanter is much deeper than wide and is as deep as the femur. The *femur* has a fairly long and well-defined stalk, beyond which it is slightly attenuated towards the end. It is distinctly 2·2 as long as wide; the anterior outline is very slightly convex and then a trifle concave, while the posterior, beyond the stalk, is rather abruptly convex and then almost straight; dorsally it is gradually but distinctly convex, most raised just beyond the middle and then concave; it is about as wide as deep. The *tibia*, which has a fairly long and well-defined stalk, is a little longer and wider than the femur and is 2·1 as long as wide: anteriorly it is beyond the stalk distinctly convex, and posteriorly beyond the condylus and slightly marked basal elevation almost straight or even a trifle concave and then terminally distinctly convex; ventrally it is moderately convex and dorsally slightly produced, while the antero-dorsal surface has generally a moderately deep and rounded tubercle, but sometimes a deeper and more conical one, resembling that of *Ch. machrochelatus* Töm. The *chela*, which is 2·8 as long as wide, is almost 1·2 broader than the trochanter is long; the *hand*, which is somewhat longer, but 1·4 wider, than the tibia, is about 1·6 as long as wide, scarcely 1·1 deeper than wide, and about 1·3 as long as the fingers, which are distinctly 1·2 longer than hand is wide, but scarcely 1·2 longer than hand is deep, and which gape slightly; the lateral outlines are moderately convex, while the

Text-fig. 76.



Ch. argentinus Thor., ♂. Trochanter and femur of right palp in anterior view. × 24.

dorsal and ventral ones are less distinctly so. The number of *accessory* teeth is somewhat variable, but is generally large as shown in figs. 31 *a–b*, viz. eight and six anteriorly, and twelve and fifteen posteriorly, in the immovable and movable finger respectively. The movable finger has anteriorly no "*spots*" and posteriorly only a few, while the number in the immovable finger varies, but is often more or less similar to that represented in the figures (figs. 31 *a–b*).

Coxæ (text-fig. 74, p. 291).—The fourth pair are somewhat triangular, distinctly widened out towards the extremity, and have the hinder margin much longer than the inner and not very well separated from it.

Legs (Pl. XXXI. figs. 31 *c–d*).—The hairs are moderately long. The legs are long and slender; the tibia of the first pair of legs is 1·2 as long as the *tarsus*, which is five times as long as deep; the *femur* of the fourth pair of legs is 2·9 as long as deep, scarcely longer than the tibia and about half as deep as the tarsus is long.

Colour.—The palps and the head are dark reddish brown; the tergal sclerites blackish brown.

Measurements.—Cephalothorax 1·150 (0·989); abdomen 2·530 (1·265) mm.

Palps: trochanter 0·598 (0·368); femur 0·966 (0·435); tibia 1·012 (0·495); hand 1·081 (0·690), depth 0·736; finger 0·851 mm.

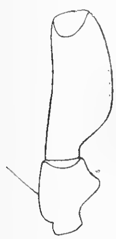
Leg I.: femur 0·722 (0·220), trochantin 0·144 (0·236); tibia 0·593 (0·140); tarsus 0·494 (0·099) mm.

Leg IV.: femur 0·851 (0·296); tibia 0·851 (0·170); tarsus 0·585 (0·120) mm.

Female.

Palps (Pl. XXXI. figs. 31 *e–f*; text-fig. 77).—The dorsal protuberance of the *trochanter* is much lower and more rounded (fig. 77); the *femur* is less abruptly convex as well posteriorly as dorsally, and has no terminal concavity dorsally. The *tibia*, which is 2·2 as long as wide, is anteriorly moderately convex, and posteriorly only slightly so terminally; the ventral outline is moderately convex and the dorsal is very slightly so, and has the antero-dorsal surface scarcely produced. The *chela*, which is three times as long as wide, is only 1·1 broader than the trochanter is long; the hand is almost 1·8 as long as wide, a trifle wider than deep, and 1·4 as long as the fingers, which are about 1·3 longer than the hand is either wide or deep, and scarcely gape when closed; the lateral, as well as the dorsal and ventral margins of the hand, are less distinctly convex. The numbers of accessory teeth and of spots are generally somewhat smaller (figs. 31 *e–f*).

Text-fig. 77.



Ch. argentinus Thor., ♀. Trochanter and femur of right palp in anterior view. ×24.

Coxæ (text-fig. 75, p. 291).—The fourth pair have a quite different shape, being much broader and scarcely widened out towards the extremity, with the inner margin much longer than the hinder and of a somewhat trapezoidal appearance.

Legs.—The legs differ only in mere trivialities from those of the male.

Measurements.—Cephalothorax 1·150 (1·081); abdomen 3·32 (1·38) mm.

Palps: trochanter 0·575 (0·345); femur 0·966 (0·437); tibia 1·035 (0·460); hand 1·127 (0·647), depth 0·635; finger 0·828 mm.

Leg I.: femur 0·714 (0·205), trochantin 0·137 (0·225); tibia 0·593 (0·137); tarsus 0·479 (0·095) mm.

Leg IV.: femur 0·851 (0·296); tibia 0·858 (0·175); tarsus 0·593 (0·122) mm.

Variation.—The numerous specimens of this species which I have examined differ in several respects, viz. size, granulation of the cephalothorax, shape of joints of palps, especially shape of the tibia of the male, &c., but on the whole are as described.

Material.—Of this species I have examined a great number of specimens (about 150), most of which were sifted by Dr. Meinert in Venezuela from June to September; several females collected in August carried their eggs fastened to the abdomen. Other specimens were collected in Mexico, Brazil, and Argentine (Dr. W. Sörensen; under bark, Riacho dell' Oro). It has previously been recorded from Venezuela, Ecuador, Brazil, Paraguay, and Argentine.

Parasitism.—A male from La Moka had two minute mites, probably larval stages of a *Tyroglyplus*, fastened to the trochantin of the first pair and to the articular membrane between the femur and tibia of the fourth pair respectively.

Remarks.—Regarding the differences between this species and *Ch. macrochelatus* Töm. I refer to that species; from *Ch. similis* Balz. it differs by much larger size and shorter hairs, as well as by comparatively shorter and less slender palps—for instance, the fingers, which are 1·2 (♂) or 1·3 (♀), not 1·4, as long as hand is wide.

46. Chelifer macrochelatus Töm. (Plate XXXI. fig. 32 *a*; text-figs. 72–73, 78–80.)

1884. Tömösváry, (5) p. 20, tab. i. figs. 12–13.
1891. *Lamprochernes macrochelatus* Töm., Balzan, (11) pp. 513–514, pl. 9. figs. 4–4 *a*.
1902. Ellingsen, (15) pp. 152–154.
1905. Ellingsen, (17) p. 1.
1905. Ellingsen, (18) p. 6.
1907. *Chelifer nodulimanus* Töm., pars, Tullgren (23) pp. 46–49, figs. 10 *a–f*.

Male.

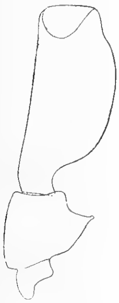
Cephalothorax.—Large distinct *ocular* spots are found. The cephalothorax, which is somewhat longer than wide, has the almost straight broad anterior *stripe* very prominent, while the posterior is less distinct and is slightly curved forwards in the middle; from the anterior stripe to half distance from the front margin a longitudinal groove or depression is found; the second thoracic tergite is divided by a longitudinal dark band.

Abdomen.—The fairly long and slender, but somewhat depressed abdomen has all the tergites but the first and the eleventh longitudinally divided. The tergites have the sclerites smooth or indistinctly shagreened, and have along their hindmost margin about 18 moderately long hairs in addition to a median and generally two lateral hairs in front of the row on each side; the number and arrangement of "tactile" hairs are probably as in *Ch. similis* Balz.

Antennæ (text-fig. 72, p. 290).—The *galea*, which extends very much beyond the terminal hair, is very powerful and has numerous branches; it is very variable, as seen by comparing text-fig. 72 with Balzan's fig. 4 *a* (pl. 9).

Palps (Pl. XXXI. fig. 32 *a*; text-figs. 78–79).—The palps are polished and almost smooth, except the shagreened dorsal tubercle of the trochanter and minutely granular surface of the femur and tibia; the hairs are moderately long or long. The *trochanter*, which is 1·5 as long as wide, is anteriorly very slightly convex and posteriorly produced into a basal rounded and fairly prominent tubercle; dorsally it is prolonged into a deep protuberance of a characteristic shape, having on the whole a somewhat triangular appearance, with the obtusely-pointed tip directed somewhat towards the extremity; the outline is obtusely-pointed proximally and almost semicircular distally with the tip well-defined from the lower part; the trochanter is much deeper than wide, almost as deep as long, and deeper than the femur. The *femur* has a rather short and well-marked stalk, beyond which it is only slightly attenuated towards the extremity. It is 2·2 as long as wide; anteriorly it is slightly convex and then concave, while the posterior outline beyond the stalk is abruptly convex and then almost straight; the dorsal outline beyond the stalk is abruptly convex and then moderately so, most raised beyond the middle, passing into the rather sudden terminal concavity; the femur is a little deeper than wide. The *tibia*, which has a long fairly well-defined stalk, is somewhat longer and wider than the femur, and is almost 2·2 as long as wide; the anterior outline is first moderately convex and then terminally a trifle concave, while the posterior, beyond the fairly well-marked condylus and elongated, but ill-defined, basal elevation, is very slightly concave and then terminally moderately convex; the ventral outline is moderately convex, while the dorsal is slightly produced; and the antero-dorsal surface forms a somewhat conical, rounded, and very prominent tubercle. The *chela*, which is almost three times as long as wide, is scarcely 1·2 as broad as the trochanter is long; the *hand*, which is about as long as the tibia, but 1·3 as wide, is 1·7 as long as wide, but only 1·3 as long as deep, is 1·3 deeper than wide, and about 1·3 as long as the fingers, which are 1·3 as long as the hand is wide, but only a trifle (1·05) as long as hand is deep, and which gape considerably when closed; the lateral outlines of the hand are only slightly convex and so is the ventral, while the dorsal one is almost semicircular. The

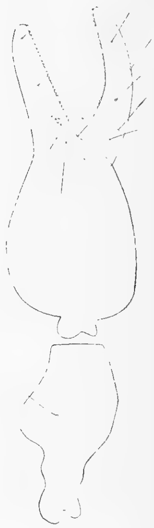
Text-fig. 78.



Ch. macrochelatus Töm., ♂. Trochanter and femur of right palp in anterior view. × 24.

number of *accessory* teeth is very large, viz. anteriorly 10 and 15 in the movable and immovable finger respectively, while both fingers have posteriorly about 30 in addition to the marginal row. The immovable finger has numerous *spots*, especially posteriorly, while the movable finger has only two posteriorly (*cf.* fig. 32 *a* and text-fig. 79).

Text-fig. 79.



Ch. macrochelatus Töm., ♂. Tibia and chela in posterior view. × 24.

Coxæ.—The coxæ are scarcely different from those of *Ch. argentinus* Thor. (*cf.* above).

Legs.—The hairs are rather short. The legs are long and slender; the tibia of the first pair of legs is almost 1·3 as long as the *tarsus*, which is 4·5 as long as deep; the *femur* of the fourth is 2·8 as long as deep, scarcely 1·1 as long as the tibia, and about 1·8 lower than the tarsus is long.

Colour.—The palps and the cephalothorax are dark reddish brown, while the tergal sclerites are pale brown.

Measurements.—Cephalothorax 1·38 (1·20); abdomen 3·0 (1·5) mm.

Palps: trochanter 0·690 (0·460); femur 1·245 (0·552); tibia 1·311 (0·621); hand 1·334 (0·805), depth 1·012; finger 1·058 mm.

Leg I.: femur 0·897 (0·253), trochantin 0·140 (0·276); tibia 0·736 (0·184); tarsus 0·575 (0·125) mm.

Leg IV.: femur 1·058 (0·375); tibia 1·00 (0·207); tarsus 0·667 (0·150) mm.

Female.

Palps (text-fig. 80).—The granulation of the palps is perhaps somewhat better marked. The dorsal protuberance of the *trochanter* is somewhat lower and has a similar, but less characteristic shape, as its tip is not marked out from the rest, but regularly rounded, and as the proximal margin is scarcely obtuse-angled; the trochanter is as deep as, not deeper than, the *femur*, which dorsally does not show any trace of terminal concavity. The *tibia*, the stalk of which appears less slender on account of the almost straight posterior margin, has the antero-dorsal surface very slightly produced. The *hand*, which is longer, but 1·4 wider, than the tibia, is 1·9 as long as wide, scarcely deeper than wide, and 1·5 as long as the fingers, which are only 1·2 as long as the hand is wide and scarcely gape when closed; the lateral outlines are a little more distinctly convex than in the male, while the dorsal and ventral ones are less distinctly convex. The number of accessory teeth is much smaller, viz. anteriorly about five in both fingers and posteriorly about twelve, while the number and arrangement of spots is practically as in the male.

Text-fig. 80.

Ch. macrochelatus Töm., ♀. Trochanter and femur of right palp in anterior view. × 24.

Legs.—The *tarsus* of the first pair is 4·8 as long as deep, and the *femur* of the fourth pair of legs is 2·9 as long as deep, but scarcely longer than the tibia.

Measurements.—Cephalothorax 1·380 (1·265); abdomen 2·75 (1·75) mm.

Palps: trochanter 0·736 (0·483); femur 1·311 (0·590); tibia 1·334 (0·635); hand 1·495 (0·874), depth 0·874; finger 1·012 mm.

Leg I.: femur 0·943 (0·276), trochantin 0·161 (0·299); tibia 0·782 (0·184); tarsus 0·598 (0·126) mm.

Leg IV.: femur 1·173 (0·405); tibia 1·150 (0·220); tarsus 0·713 (0·150) mm.

Variation.—The specimens examined varied rather considerably in size, those of which the measurements are given being the largest at my disposal; the smallest male examined, which was referred to this species (from La Moka), had the tibia of the palps 1·104 mm. long. A single female from Rio Janeiro, with the tibia 1·15 mm. long, was only with hesitation referred to this species, as the outlines of the tibia were more strongly convex. The characteristic shape of the trochanteral tubercle dorsally, as well as that of the protuberance of the tibia in the male, is in many specimens only slightly pronounced.

Material.—Of this species I have examined a number of specimens (22 ♀ and 12 ♂) found beneath the elytra of a specimen of *Acrocrinus longimanus* from Brazil; three small, almost dark specimens from Tobasis Kapa (Keyserling Coll.); Dr. Meinert collected in Venezuela a single small male in the month of December at Hacienda Elias, Los Trinchéras, as well as two in the month of August at La Moka by sifting; Reinhardt collected a single female in Rio Janeiro. This species has previously been recorded from the greater part of the sub-continent, viz. Venezuela, Brazil, Ecuador, Paraguay, and Chile.

Remarks.—That the species described above is identical with that described by Balzan as well as Ellingsen under this name I regard as certain, in spite of much larger measurements given by Balzan, especially compared to those of a rather small specimen which I had the opportunity of examining by the kindness of Mr. Ellingsen. This species is very nearly related to *Ch. argentinus* Thor., so nearly that the position of some specimens is not easily ascertained, but I nevertheless regard it as a well-defined species, but one with a very wide range of variation. The female differs generally from that of *Ch. argentinus* Thor. by its larger size, by the less slender, more depressed abdomen, by the more distinctly granular cephalothorax, by the hand, which is at least not wider than deep, and by the fingers, which are only 1·2 longer than the hand is deep, and by the tarsus of the first pair of legs, which is only 4·8 as long as deep. The male differs besides by the characteristic dorsal tubercle of the trochanter, by the pronounced protuberance of the tibia, by the hand, which is 1·3 as deep as wide, and the fingers, which are only 1·05 longer than hand is deep. According to Ellingsen the main character seems to be the granulation of the head, but this scarcely holds good (*cf.* above). Concerning the relation of the described species to that which Tömösváry described, I refer to Ellingsen's discussion (15. p. 154).

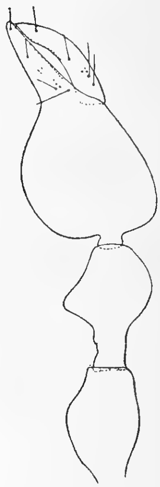
47. Chelifer nodulimanus Töm. (Plate XXXI. fig. 33 *a*; text-fig. 81.)

1882. Tömösváry, (4) p. 244.
1884. Tömösváry, (5) p. 26, tab. i. fig. 14.
1889. Daday, (8) pp. 173–174, tab. iv. figs. 3 & 9.
1905. Ellingsen, (18) pp. 3–6.
1906. With, (20) p. 171.
1907. *Chelifer nodulimanus* Töm. pars (?) Tullgren, (23) pp. 46–49, figs. 10 *a–f*.

Male.

Cephalothorax.—Large distinct *ocular* spots. The cephalothorax, which is somewhat longer than wide, has the almost straight anterior transverse *groove* fairly prominent in contradistinction to the posterior less prominent one, which is slightly curved forwards in the middle. The integument in front of the median groove is minutely, but distinctly *granular*; behind it is almost smooth or rather indistinctly granular (specimen from Tobasis Kapa); the hairs are rather short. In front of the anterior groove a longitudinal depression is found, passing into a deep cavity situated almost in the middle of the head (*cf.* Ellingsen, 18. p. 4).

Text-fig. 81.



Ch. nodulimanus Töm., ♂. Femur, tibia, and chela of right palp in posterior view. × 13·5.

Abdomen.—The moderately long and depressed abdomen has all the tergites, with the exception of the first and the eleventh, longitudinally divided. The sclerites are indistinctly shagreened, and each tergite has along the hindmost margin about 30 rather short hairs in addition to one or two lateral and a single median hair in front of the row; "tactile" hairs are missing in the specimens examined.

Antennæ.—The *galea*, which is very powerful and almost twice as long as the terminal hair, is bifurcate, each branch again being strongly divided.

Palps (Pl. XXXI. fig. 33 *a*; text-fig. 81).—The palps are almost smooth or minutely granular, most distinctly on the inner surface of the femur and tibia; the fingers are not smooth but fairly distinctly granular. The hairs are long or moderately so; a number of long, slender, and completely simple ones are found on the dorsal tubercle of the tibia in addition to the usual long and slender ones of the posterior surfaces (*cf.* 18. p. 4). The *trochanter*, which is 1·5 as long as wide, is anteriorly very slightly convex and posteriorly produced into a prominent and somewhat rounded tubercle; dorsally it is prolonged into a deep, pointed protuberance (fig. 33 *a*) somewhat similar to that of the preceding species, but less suddenly attenuated terminally, less distinctly obtuse-angled proximally, and more moderately convex towards the end; it is much deeper than wide, but less deep than the femur. The *femur* has a long and fairly well-defined stalk, beyond which it is scarcely attenuated towards the end. It is 2·3 as long as wide; its anterior outline is almost straight, while the posterior is strongly, but not very abruptly convex and then slightly so; the dorsal outline is first moderately convex and then towards the middle distinctly convex, being most raised just beyond the middle, rather steeply sloping into the terminal concavity; the femur is much deeper than broad. The *tibia*, which has a very long and fairly well-defined stalk, is distinctly longer and wider than the femur, and is 2·1 as long as broad; the anterior outline is first moderately convex, and then a trifle concave, while the posterior beyond the not very prominent condylus and elongated basal elevation is moderately concave and then distinctly convex; the ventral outline is almost semicircular distally and the dorsal one is distinctly produced, as the antero-dorsal surface is prolonged into a deep, conical, and somewhat rounded protuberance. The *chela*, which is 2·8 as long as deep, is scarcely 1·2 as broad as the trochanter is long; the *hand*, which is much longer and about 1·4 wider than the tibia, is 1·4 as long as wide, but scarcely 1·2 as long as deep, 1·3 as deep as wide, and about 1·3 as long as the fingers, which are 1·2 as long as the hand is wide but 1·1 shorter than the hand is deep, and which gape widely when closed; the lateral outlines of the hand are only slightly convex, while the ventral one is distinctly so, and the dorsal almost semicircular. Anteriorly both fingers possess at least ten *accessory* teeth, and posteriorly about fifteen. The immovable finger has posteriorly about eleven "*spots*" behind the basal tactile hairs, and eight in a longitudinal row beyond; posteriorly only a few are found (as seen in text-fig. 81).

Coxæ.—The fourth pair are almost exactly like those of *Ch. argentinus* Thor.

Legs.—The hairs are moderately long. The legs are very long and slender; the tibia of the first pair is 1·3 as long as the *tarsus*, which is 4·9 as long as deep; the *femur* of the fourth pair of legs is 3·1 as long as deep, scarcely longer than the tibia, and about half as deep as tarsus is long.

Colour.—The palps and the head are dark reddish brown, the thorax is yellowish brown, and the abdominal sclerites are dark brown. The legs have the anterior surface yellowish, but the posterior dark brown, a difference which is most marked in the first pair of legs, and which is also indicated in the preceding species.

Measurements.—Cephalothorax 2·2 (2·0); abdomen 3·75 (2·25) mm.

Palps: trochanter 1·104 (0·736); femur 1·840 (0·805); tibia 1·905 (0·920); hand 1·955 (1·265), depth 1·656; finger 1·541 mm.

Leg I.: femur 1·265 (0·345), trochantin 0·230 (0·391); tibia 1·150 (0·230); tarsus 0·782 (0·161) mm.

Leg IV.: femur 1·495 (0·475); tibia 1·505 (0·253); tarsus 0·920 (0·184) mm.

Variation.—One of the two specimens, a badly preserved one from Tobasis Kapa, was almost black, had the granulation of the cephalothorax more pronounced, and showed minor differences in the proportions of the palps and legs.

Material.—Of this species I have examined two specimens (♂), the one found beneath the elytra of a specimen of *Acrocrinus longimanus* from Brazil and the other from Tobasis Kapa (Keyserling Coll.), both found in company with specimens of *Ch. macrochelatus* Töm. Ellingsen's specimen is from Brazil, found under exactly the same circumstances as the former of the above-mentioned; all other localities may, as shown by Ellingsen (*cf.* 18. p. 5), be regarded as doubtful.

Remarks.—Well-developed specimens (♂) of this species can scarcely be confounded with any other form of Chelonethi on account of its powerful palps, with the peculiar shape of the dorsal tubercle of the trochanter and tibia, the long and slender stalks of femur and tibia, as well as by its exceedingly deep hand with the gaping fingers; but perhaps smaller animals are less easily distinguished from very large specimens of *Ch. macrochelatus* Töm., for instance that of which Balzan has given the measurements (11. p. 513)—perhaps Balzan has, like Daday (*cf.* 8. p. 173, and Ellingsen, 15. p. 154), confounded the two species. As regards the relation of the South-American species to Tömösváry's typical form from Dalmatia, I refer to Ellingsen's discussion (18. pp. 5–6).

48. CHELIFER CERVUS Balz. (Plate XXXI. figs. 34 *a–e*; text-fig. 82.)

1890. Balzan, (10) pp. 412–414, tav. xiii. figs. 2–2 a^{ii}.
1891. Balzan, (11) pp. 514 & 548, pl. 9. fig. 4 *b*.
1902. Ellingsen, (15) pp. 165–167.

Male.

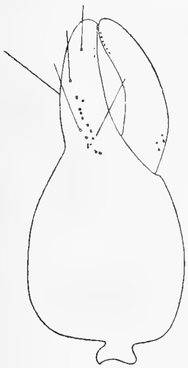
Cephalothorax.—Large *ocular* spots rather indistinct. The cephalothorax, which is distinctly longer than broad, has two broad transverse *stripes*, of which the more prominent anterior one is curved backwards in the middle, while the posterior almost straight stripe is rather indistinct; in the middle in front of the anterior stripe a rather shallow longitudinal depression is observed. The integument of the head appears polished and is very minutely granular, but is behind the median transverse stripe smooth or almost so; the hairs are rather short.

Abdomen.—The fairly long and slender abdomen has all the tergites with the exception of the eleventh longitudinally divided, the first three are wider, but distinctly shorter than the following. The sclerites are almost smooth and the tergites bear along the hindmost margin from 14 to 20 moderately long (?) hairs, and the median tergites possess in addition to these two lateral and a single median hair in front of the row on each side; "tactile" hairs missing in examined specimen. The ventral surface behind the genital area was distinctly keeled, the two sclerites of each sternite making an acute angle with each other.

Antennæ (Pl. XXXI. fig. 34 *a*).—The *galea*, which extends distinctly beyond the terminal hair, is provided with a large number of branches as seen in figure.

Palps (Pl. XXXI. fig. 34 *b*; text-fig. 82).—The palps are almost smooth except anteriorly, where they are minutely granular. The trochanter and the anterior surface of the femur are beset with a number of moderately long, stiff, and not completely simple *hairs*; the posterior surface of the femur and the tibia as well as the protuberance of the latter are densely covered—almost *shaggy*—with long, slender, and completely simple hairs; similar but shorter hairs cover the hand. The *trochanter*, which is almost 1·5 as long as wide, is anteriorly very slightly convex and posteriorly is produced into a fairly prominent and rounded basal tubercle; dorsally it is prolonged into a very deep, conical, obtusely pointed protuberance; observed from the front this protuberance is most similar to an acute-angled triangle, with the proximal margin slightly convex and the opposite a trifle concave; the trochanter is as deep as long and much deeper than the femur is. The *femur* has a rather short and well-defined stalk, beyond which it is attenuated towards the end. It is 2·2 as long as wide; the anterior outline beyond the stalk is almost straight, while the posterior is first rather abruptly convex and then slightly so; the dorsal outline beyond the stalk is abruptly convex and then very slightly so, with a fairly pronounced terminal concavity; the femur is distinctly deeper than wide. The *tibia*, which has a long and slender, not very well-defined stalk, is longer and wider than the femur, and is 2·3 as long as wide; anteriorly it is slightly convex, and posteriorly beyond the well-marked condylus and fairly distinct basal elevation almost straight and then moderately convex; the ventral margin is almost circular, and the dorsal anterior surface is prolonged into a deep, rounded, somewhat conical protuberance. The *chela*, which is three times as long as deep, is 1·2 as broad as the trochanter is long; the *hand*, which is somewhat longer than, but 1·4 as wide as, the tibia, is 1·7 as long as wide but only 1·2 as long as deep, 1·4 as deep as broad, and scarcely 1·3 as long as fingers, which are almost 1·4 as long as hand is wide but a trifle shorter than it is deep, and which gape widely when closed; the lateral outlines are moderately convex, while the dorsal is very suddenly raised, being almost perpendicular on the stalk, and then slightly convex; the ventral margin is less suddenly raised and then almost straight. The marginal teeth are fairly well developed, where the fingers touch each other in their terminal fifth, but more proximally are very low or almost obsolete; *accessory* teeth were not observed posteriorly, but anteriorly the immovable finger has five and the movable seven near to the tip. Anteriorly the immovable finger has about 15 "*spots*" and the movable four (*cf.* fig. 82), while the immovable posteriorly has seven spots.

Text-fig. 82.



Ch. cervus Balz., ♂. Chela of left palp in anterior view. × 24.

Coxæ.—The second and third pair are more slender than the corresponding in the preceding species. The fourth pair are somewhat triangular, as the inner and hinder margins, of which the former is a little longer, gradually merge into each other; the coxæ are scarcely widened out towards the extremity.

Legs (Pl. XXXI. figs. 34 *c–e*).—The hairs are moderately long and stiff, not quite simple; long, slender, completely simple hairs are placed dorsally at the tip of the femur, somewhat beyond the middle in the tibia, and one-fourth removed from the base in the tarsus, the latter at least as long as the distance to the end. The legs are moderately long and slender; the tibia of the first pair of legs is 1·3 as long as the *tarsus*, which is five times as long as deep; the *femur* of the fourth pair of legs is 2·8 as long as deep, 1·1 as long as tibia, and 1·7 lower than tarsus long. The *claws* show a remarkable structure; the posterior claw of the first pair is distinctly curved and pointed, but just beyond the middle is widened out to a large, somewhat rounded, and triangular process or tooth (fig. 34 *d*); the anterior claw of the first pair, as well as both claws of the fourth pair, has a similar median, but somewhat posteriorly placed tooth (figs. 34 *c* & *e*).

Colour.—Palps and head reddish brown; the thorax is lighter brown and the tergal sclerites are yellowish brown.

Measurements.—Cephalothorax 1·38 (1·15); abdomen 2·75 (1·10) mm.

Palps: trochanter 0·690 (0·483); femur 1·265 (0·570); tibia 1·380 (0·610); hand 1·449 (0·851), depth 1·173; finger 1·150 mm.

Leg I.: femur 0·897 (0·299), trochantin 0·155 (0·322); tibia 0·775 (0·195); tarsus 0·574 (0·116) mm.

Leg IV.: femur 1·196 (0·425); tibia 1·081 (0·230); tarsus 0·713 (0·161) mm.

Material.—Of this species I have examined a single male from the Amazons; it has previously been recorded from Matto Grosso and Surinam.

Remarks.—The described form differs from Balzan's description by smaller size, by slightly different shape of galea (*cf.* 10. fig. 2 *a*), by the less produced posterior surface of the trochanter, and by the different proportions of the joints of the palps; the most important of these differences, namely that found in the very wide hand of the palps, which is much wider than the finger is long, is easily explained by the fact that he has measured the hand not in a true dorsal but in a partly lateral view. From Ellingsen's description it differs in points of even smaller importance; and consequently I regard the identification of the male from the Amazons with those from Matto Grosso and Surinam as beyond doubt.

This species shows in the very important character found in the claws of the legs similarity to the following species, but I nevertheless think that it is more nearly related to *Ch. nodulimanus* Töm. and allied species on account of the large galea, the structure of the head, and striking similarities in all the joints of the palps as well as in the legs. A rather remarkable dissimilarity is found in the structure of the tibia, if Ellingsen is right in the statement that its conical protuberance is equally well developed in the female and the male (*cf.* 15. p. 167).

49. CHELIFER DEPRESSIMANUS, sp. n. (Plate XXXI. figs. 35 *a–d.*)

Female.

Cephalothorax.—Rather indistinct *ocular* spots. The cephalothorax, which is distinctly longer than wide, has the anterior transverse *stripe* broad, almost straight, and fairly prominent, whilst the posterior is almost obsolete. The integument appears polished and is completely smooth with moderately long hairs.

Abdomen.—The very long slender abdomen has all the tergites with the exception of the first and the eleventh longitudinally divided, but not very distinctly so. The sclerites are smooth, and along the hindmost edge of each tergite is a row of about 14 moderately long hairs, in addition to one or two lateral and a single median hair in front of the row on each side; the "tactile" hairs were missing in the specimen examined.

Antennæ.—The moderately long, slender *galea,* which extends somewhat beyond the terminal hair, has six inferiorly placed teeth distally.

Palps (Pl. XXXI. figs. 35 *a–b*).—The palps are almost smooth except on the anterior surface, which is minutely and rather indistinctly granular. The long or moderately long hairs are stiff and not completely simple; long, slender, completely simple hairs are only observed posteriorly just behind the tip of the femur and in the middle of the tibia. The *trochanter*, which is 1·5 as long as wide, is anteriorly slightly convex and posteriorly produced into a rounded and rather low basal tubercle; dorsally it is prolonged into a not very deep, somewhat conical, and rounded protuberance; the trochanter is deeper than wide, but scarcely as deep as the femur. The *femur* has a short well-defined stalk, beyond which it is attenuated towards the end. It is twice as long as broad; the anterior outline is first slightly convex and then concave, while the posterior beyond the stalk is very abruptly convex, almost perpendicular, and then almost straight; the dorsal outline is almost exactly like the posterior. The *tibia*, which has a rather short but well-defined stalk, is a little longer and wider than the femur, and is 1·9 as long as wide; the anterior outline is very strongly convex, almost semicircular in the middle, and then a trifle concave, while the posterior beyond the prominent condylus and slightly marked basal elevation is almost straight and then strongly convex; the dorsal as well as the ventral outlines are moderately convex. The *chela*, which is 2·7 as long as wide, is almost 1·2 as broad as the trochanter is long; the *hand*, which is somewhat longer and about 1·3 as wide as the tibia, is 1·6 as long as wide but 1·9 as long as deep, 1·1 as wide as deep, and is 1·5 as long as the fingers, which are 1·1 as long as hand is wide, but 1·2 as long as it is deep, and do not gape when closed; the lateral outlines are moderately convex, while the dorsal and ventral are almost straight. Anteriorly each finger has a single accessory tooth, while posteriorly each possesses a few in the distal third; the movable finger has only two spots anteriorly near to the base, while the immovable finger has five anteriorly, of which two are very large, two small (fig. 35 *b*), and one very large placed posteriorly.

Coxæ.—The coxæ are very similar to those of *Ch. argentinus* Thor. (*cf.* text-fig. 75); the fourth are trapezoidal, scarcely widened out towards the extremity, and with the inner and hinder margins, between which is a distinct obtuse angle, of almost equal length.

Legs (Pl. XXXI. figs. 35 *c–d*).—The hairs are rather short, with a long, slender, compleely simple hair placed dorsally, somewhat beyond the middle of tibia IV., as well as one tarsal, one-fourth removed from the base and as long as the distance to the tip; the terminal dorsal one of femur IV. was not observed, but a long, not completely simple one is placed dorsally near the tip of the tibia. The legs are rather short and clumsy; the tibia of the first pair is 1·1 as long as the *tarsus*, which is four times as long as deep; the *femur* of the fourth pair of legs is 2·3 as long as deep, almost 1·2 as long as the tibia, and only 1·3 lower than the tarsus is long. The anterior *claw* of the first pair of legs has a rather small median tooth, and the posterior has a rather large triangular process (fig. 35 *c*), while the anterior claw (*ci*) of the fourth pair of legs has practically no tooth and the posterior has a rather big, somewhat triangular tooth (*cf.* fig. 35 *d*, *ce*).

Colour.—The palps and cephalothorax are reddish brown; and the tergal sclerites are dark brown.

Measurements.—Cephalothorax 0·690 (0·598); abdomen 2·185 (0·920) mm.

Palps: trochanter 0·335 (0·220); femur 0·552 (0·276); tibia 0·575 (0·310); hand 0·647 (0·391), depth 0·345; finger 0·437 mm.

Leg I.: femur 0·410 (0·144), trochantin 0·076 (0·152); tibia 0·296 (0·099); tarsus 0·266 (0·068).

Leg IV.: femur 0·524 (0·228); tibia 0·448 (0·132); tarsus 0·296 (0·084) mm.

Material.—Of this species I have examined a single badly preserved female from Uruguay (Keyserling Coll.).

Remarks.—This species shows in the shape of the palps great similarity to *Ch. ovatus* Balz. (*cf.* fig. 6, pl. 9, II), but as it is much smaller, as the galea is much better developed, and as Ba zan does not mention the presence of teeth in the claws, I do not hesitate in establishing my specimen as a new species. In the shape of the claws this species shows certainly greater similarity to *Ch. cervus* Balz. than to any other, but, nevertheless, I am not convinced that the two are nearly related to each other (*cf.* above).

IV. Group of Chelifer birmanicus Thor.

Femur of the first pair of legs with wide oblique articular cavity, with posterior condylus placed near ventral margin. Real eyes always wanting. Fingers of palps without accessory teeth. "Tactile" hair of tarsus IV. basal. Genital area of ♂ of birmanicus *type.*

(*Claws as well as subterminal hair simple. Transverse grooves indistinct or wanting. Hairs pointed and almost simple; tibia of palps basally with a pair of long, slender, completely simple hairs. Flagellum consists of four hairs, and sexual difference is found in the galea.*)

I think that the two following species are naturally referred to the same group as *Ch. birmanicus* Thor. (*cf.* 20. p. 133), as they entirely agree with that species in structure with the exception of the genital area of the male, which in the badly preserved specimens of *Ch. nidificator* Balz. at least is less conspicuous than in *Ch. birmanicus* Thor. (*cf.* 20. p. 124, tab. iii. fig. 10 *a*), but nevertheless seems to be similar in important features. As seen from the above, only two species of those which Ellingsen refers to *Atemnus* Can. (*cf.* 18. p. 2) belong to this group, the other three are more naturally referred to the subgroup of *Ch. subrobustus* Balz.

Synopsis of Species.

a. Trochanter not bigibbose; tibia with short stalk . . . . 50. *Ch. nidificator* Balz.
b. Trochanter distinctly bigibbose; tibia with long and slender stalk . 51. *Ch. elongatus* Ell.

50. Chelifer nidificator Balz. (Plate XXXI. figs. 36 *a–c*; text-fig. 83.)

1890. Balzan, (10) pp. 417–418, tav. xiii. figs. 5–5 *b*.
1891. *Atemnus nidificator* Balzan, (11) pp. 510–511, pl. 9. fig. 1.
1902. Ellingsen, (15) pp. 146–148.
1905. Ellingsen, (18) p. 2.
1905. Ellingsen, (19) pp. 323–324.
1907. Tullgren, (23) p. 56.

Male.

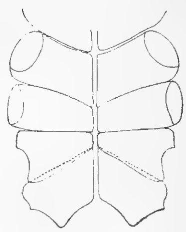
Cephalothorax.—Ocular spots rather indistinct. The cephalothorax, which is scarcely longer than wide, has no transverse *grooves*, is smooth and provided with fairly long hairs.

Abdomen.—The fairly long slender abdomen has generally the tergites indistinctly divided with the exception of the first three and the last one; the division of the tergites is sometimes not complete, consisting of an anterior and a posterior incision separated in the middle; a similar incision may be observed in the second and third segments posteriorly as well. The sclerites are smooth, and the tergites possess along their hindmost margin from 8–12 long or very long, almost simple *hairs* placed within white spots; in front of the row a single hair is observed laterally, but none in the middle. The last two tergites each bear two pairs of very long and slender "tactile" hairs and so do the corresponding sternites. The genital area is very inconspicuous.

Antennæ.—The *galea*, which extends a little beyond the terminal hairs, is short and slender, with a few terminal teeth. The *flagellum* consists of four hairs, of which the longer anterior one is serrated, but with smaller teeth than in Balzan's figure 5 *b* (10).

Palps (Pl. XXXI. figs. 36 *a–b*).—The *maxillæ* are smooth and so are the palps, except part of the anterior surface, especially of the femur and tibia. The *hairs* are long and fairly long, stiff, and not completely slender; the following very long and slender completely simple hairs were observed, viz., three on the femur (two somewhat behind the tip, the one above the other, and the third posterior and terminal), two on the tibia above and below the basal elevation, and three at the base of the hand in a transverse row (one more dorsally placed and two more ventral). The *trochanter*, which is 1·5 as long as wide, is anteriorly slightly convex, and posteriorly produced into a rounded, not very pronounced tubercle; dorsally it is prolonged into a low, rounded, and slightly conical protuberance. The *femur* has a very short, well-defined stalk, beyond which it is suddenly enlarged and then distinctly attenuated towards the end. It is twice as long as broad; the anterior outline beyond the stalk is rather suddenly convex and then slightly concave, while the posterior, beyond the stalk, is very abruptly convex and then slightly so; dorsally the outline is first abruptly convex and then almost straight. The *tibia*, which has a very short and well-defined stalk, is longer and wider than the femur and is 1·9 as long as broad; anteriorly it is very strongly convex in the middle and a trifle concave terminally, while posteriorly, beyond the not very large condylus and insignificant basal elevation, it is for a short distance almost straight and then distinctly convex; the dorsal and ventral outlines are moderately convex. The *chela*, which is 2·7 as long as wide, is almost 1·3 broader than the trochanter is long; the *hand*, which is somewhat longer than, but 1·3 as wide as, the tibia, is 1·6 as long as wide, about 1·1 wider than deep, and 1·4 as long as the fingers, which are 1·1 as long as the hand is wide and do not gape when closed; the lateral outlines are slightly convex, while the dorsal and ventral ones are almost straight. No *accessory* teeth are observed; anteriorly four "*spots*" are observed between the three proximal "tactile" hairs (*cf.* fig. 36 *a*) in the immovable finger, but none in the movable finger; posteriorly a similar number is observed in the immovable as well as in the movable finger (*cf.* fig. 36 *b*).

Text-fig. 83.



Ch. nidificator Balz., ♂. Coxæ. × 44.

Coxæ (text-fig. 83).—The second and the third pair are somewhat enlarged towards the end; the fourth pair are trapezoidal, scarcely widened out, and with the inner margin somewhat longer than the concave hinder one.

Legs.—The hairs, which are fairly long or long, are either completely simple or with a few terminal teeth; long and slender, completely simple hairs were missing except the tarsal "*tactile*" hair of the fourth pair, which is as long as the tarsus at least and one-tenth removed from the base, and the ventral ones of the trochanters and trochantins. The legs are rather short and clumsy; the trochantin of the first pair is much deeper than the femur proper, with a very wide articulate cavity, and its tibia is 1·1 as long as the *tarsus*, which is 3·5 as long as deep; the *femur* of the fourth pair of legs is 2·3 as long as deep, 1·3 as long as the tibia, and at least 1·2 lower than tarsus is long.

Colour.—Proximal joints of the palps are more yellowish brown and distal more reddish brown; the cephalothorax and tergal sclerites are brown or yellowish brown.

Measurements.—Cephalothorax 0·805 (0·790); abdomen 2·30 (0·920) mm.

Palps: trochanter 0·391 (0·253); femur 0·690 (0·345); tibia 0·713 (0·375); hand 0·805 (0·495), depth 0·437; finger 0·552 mm.

Leg I.: femur 0·494 (·0182), trochantin 0·091 (0·205); tibia 0·380 (0·133); tarsus 0·325 (0·095) mm.

Leg IV.: femur 0·765 (0·334); tibia 0·600 (0·205); tarsus 0·410 (0·129) mm.

Female.

Antennæ.—The *galea*, which extends beyond the terminal hair, is fairly long and slender, with about six terminal teeth, as figured by Balzan (10. fig. 56 *a*).

Palps.—The *femur* and the *tibia* are comparatively less slender, being 1·9 and 1·8 respectively as long as wide; the *hand* is 1·7 as long as wide, distinctly 1·1 as wide as deep, and 1·5 as long as fingers.

Legs.—The legs are less slender, the *femur* of the fourth pair of legs 2·2 as long as deep, 1·2 as long as the tibia, and scarcely 1·2 lower than tarsus is long.

Measurements.—Cephalothorax 0·920 (0·920); abdomen 3·22 (1·495) mm.

Palps: trochanter 0·414 (0·276); femur 0·736 (0·391); tibia 0·759 (0·414); hand 0·897 (0·529), depth 0·460; finger 0·598 mm.

Leg I.: femur 0·517 (0·213), trochantin 0·095 (0·228); tibia 0·403 (0·144); tarsus 0·334 (0·099).

Leg IV.: femur 0·798 (0·357); tibia 0·646 (0·213); tarsus 0·418 (0·137) mm.

Material.—Of this species I have examined five males and five females, of which one carried a large bundle of eggs, as well as two young ones, collected by the Danish 'Galathea' Expedition in Bahia, a single male sifted by Dr. Meinert in the month of August at La Moka, and one collected by M. Simon in St. Vincent; besides these, a female, collected in Guatemala by Dr. Stoll, and a male from Tobasis Kapa were examined. This species has previously been recorded from Venezuela, Ecuador, Brazil, Paraguay, Argentine, and Haiti.

Remarks.—This species, of which the small specimens (var. *minor* Balz.) examined were exactly like one determined by Mr. Ellingsen, is easily distinguished from all other South-American species by the shape of the palps.

51. CHELIFER ELONGATUS Ell. (Plate XXXI. figs. 37 *a–g*; text-fig. 84.)

1902. Ellingsen, (15) pp. 149–151.

Female.

Cephalothorax.—*Ocular* spots indistinct. The *cephalothorax*, which is distinctly longer than wide, has no transverse grooves, is smooth and provided with fairly long hairs.

Abdomen.—The fairly long slender abdomen has all the tergites, with the exception of the first and eleventh, more or less distinctly divided longitudinally. The tergites have the sclerites smooth, and possess along their hindmost margin about ten moderately long hairs in addititon to four (six?) in front of the row; tip of the abdomen with tactile hairs.

Antennæ.—The *galea*, which extends very much beyond the terminal hair, is fairly long and slender and is provided with about six short branches in the distal third. The *flagellum* consists of four hairs, of which the anterior has about ten longer and shorter teeth along the front margin.

Palps (Pl. XXXI. figs. 37 *a–f*).—The *maxillæ* are smooth and so are the palps, with the exception of the posterior surface of the trochanter and the anterior of the three following joints, which are more or less distinctly granular. The fairly long and long *hairs* are stiff and not completely simple; long, slender, and completely simple hairs are placed posteriorly in the middle and at the tip of the femur, posteriorly at the base of the tibia, one above and one below the basal elevation, and posteriorly at the base of the hand at least a single one; the hand has ventrally between the base and the insertion of the finger a single hair (fig. 37 *d*). The *trochanter*, which is 1·5 as long as wide, is anteriorly slightly convex, almost straight, and posteriorly is produced into a rounded, fairly long tubercle; dorsally it is prolonged into a somewhat conical and fairly deep protuberance; the trochanter is somewhat deeper than wide, but not as deep as the femur is. The *femur* has a short, well-defined stalk, beyond which it is slightly attenuated towards the end. It is 2·2 as long as deep; the anterior outline is slightly convex and then concave, while the posterior is rather abruptly convex and then almost straight; dorsally the outline is first abruptly convex and then completely straight; the femur is about as deep as wide. The *tibia*, which has a long, slender, fairly well-defined stalk, is longer and wider than the femur, and is twice as long as broad; anteriorly it is very strongly convex, almost semicircular, and then terminally almost straight, while posteriorly, beyond the prominent condylus and well-marked basal elevation, it is slightly concave and then strongly convex; the dorsal outline is strongly convex, while the ventral is moderately so. The *chela*, which is 2·7 as long as wide, is about 1·2 as broad as the trochanter is long; the *hand*, which is longer and 1·3 as wide as the tibia, is 1·7 as long as wide, scarcely as wide as deep, and 1·6 as long as the fingers, which are only a trifle longer than the hand is wide; the lateral outlines are slightly convex, while the dorsal and ventral ones are almost straight. The immovable finger possesses anteriorly seven proximal "*spots*" in a longitudinal row, while the movable has none (figs. 37 *e–f*), and posteriorly the immovable finger has two "spots" and the movable a single one.

Coxæ.—The second and third pair are like those of the preceding species (*cf.* text-fig. 83), while the fourth are of a more triangular appearance with the inner and hinder margins, of which the former is much the longer, gradually merging into each other.

Legs.—The fairly long or rather short hairs are generally more or less stiff and not quite simple; the femur has dorsally a terminal, long, slender, completely simple hair; the tarsal "*tactile*" one is one-tenth removed from the base and at least as long as the tarsus. The legs are moderately long and slender; the tibia of the first pair is 1·2 as long as the *tarsus*, which is 4·3 as long as deep; the *femur* of the fourth pair is 2·4 as long as deep, 1·2 as long as tibia, and 1·2 lower than the tarsus is long.

Colour.—The palps are reddish brown and the cephalothorax as well as the tergal sclerites are pale yellowish brown; the rest of body more or less yellowish.

Measurements.—Cephalothorax 0·805 (0·690); abdomen 3·56 (1·49) mm.

Palps: trochanter 0·368 (0·253); femur 0·640 (0·285); tibia 0·667 (0·335); hand 0·713 (0·425), depth 0·437; finger 0·450 mm.

Leg I.: femur 0·456 (0·160), trochantin 0·091 (0·175); tibia 0·365 (0·106); tarsus 0·299 (0·072) mm.

Leg IV.: femur 0·631 (0·266); tibia 0·540 (0·152); tarsus 0·329 (0·091) mm.

Variation.—Another female mounted with the above mentioned was much paler and had the hairs of the comparatively short abdomen well preserved; along the hindmost margin twelve hairs in addition to six in front of the row in the median tergites; the tenth and last tergites as well as the corresponding sternites with two pairs of tactile hairs each. The palps were somewhat less slender, but in the main as described.

Male.

Abdomen &c.—The abdomen is exceedingly long and slender, the *galea* scarcely extends beyond the terminal hair, and the teeth are wanting or obsolete.

Palps (Pl. XXXI. fig. 37 *g*).—The *trochanter* is much more distinctly bigibbose than in the female, as the posterior tubercle is much longer and more conical and as the dorsal protuberance is very deep and conical. The *femur*, which is 2·3 as long as wide, is almost straight anteriorly, and posteriorly less abruptly convex. The *tibia*, which has an exceedingly long slender stalk, is 1·9 as long as wide; the anterior outline is much more strongly convex than in the female, and the posterior beyond the basal elevation is very distinctly concave and then more strongly convex than in the female (fig. 37 *g*). The *chela* is only a trifle broader than the trochanter is long; the *hand*, which is only 1·2 as wide as the tibia, is 1·5 as long as the fingers, which are 1·1 as long as hand is wide. The immovable finger has anteriorly only six "spots," less regularly arranged.

Colour.—The palps are dark reddish brown, the cephalothorax is brown, and the abdominal sclerites are almost olive-coloured, and consequently there is no sharp difference between a pale body and dark palps.

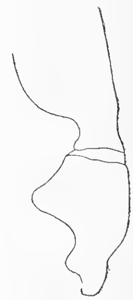
Measurements.—Cephalothorax 0·690 (0·575); abdomen 2·07 (0·69) mm.

Palps: trochanter 0·368 (0·253); femur 0·690 (0·299); tibia 0·690 (0·355); hand 0·690 (0·405), depth 0·415; finger 0·455 mm.

Material.—Of this species I have examined two females collected by Mr. Jessen at (?) Essequibo; it has previously been recorded from Ecuador.

Remarks.—The male of this species, which I was able to examine by the kindness of Mr. Ellingsen, does not differ from the original description except in a single character; Ellingsen writes: "La main presque deux fois plus longue . . . . que le femur," while the animal has the hand about as long as the femur; this mistake was caused perhaps by a slip of the pen or by an error of the printer. That the female described belongs to the same species as the male, is not quite certain. The differences between them in the shape of the body as well as in the structure of the trochanter and tibia, &c., are certainly striking, but not so great that they cannot easily be explained as sexual ones; consequently I should not think myself justified in establishing a new species. About similarity to *Ch. navigator* With, *cf.* 22. p. 63.

Text-fig. 84.



Ch. elongatus Ell., var., ♀. Trochanter of left palp in anterior view. × 44.

Variation.—In addition to the specimens mentioned I have examined a much larger female, collected in a loaf on board the Danish ship 'Galathea' in January 1847, which I feel obliged to refer to the same species, as it only differed in mere trivialities. The *trochanter* has protuberances somewhat longer (text-fig. 84) and is deeper than the femur; the *tibia* is less strongly convex anteriorly and more distinctly concave posteriorly beyond the basal elevation. The *tarsus* of the first pair of legs is only four times as long as deep; the *femur* of the fourth pair of legs is 2·5 as long as deep, 1·3 as long as the tibia, and 1·3 lower than the tarsus is long.

Measurements.—Body somewhat shorter and less slender; the trochanter of the palps 0·506 (0·322); femur 0·875 (0·405); tibia 0·897 (0·437); hand 0·897 (0·552), depth 0·575; finger 0·585 mm.

The following four South-American species will certainly always remain *nomina nuda*, if the original specimens do not exist. Not even the papers in which they are described are known to me:—

52. CHELIFER COECUS Gerv.

1849. *Chelanops coecus* Gervais, (1) p. 13, pl. i. fig. 13.

53. CHELIFER CIMEX Gerv.

1849. Gervais, (1).

54. CHELIFER EXCENTRICUS Holmb.

1874. Holmberg, (2 *a*) p. 299, pl. vi. fig. 6.

55. CHELIFER TIMIDUS Holmb.

1876. Holmberg (2 *b*).

LITERATURE.

An asterisk indicates that the book in question was not at my disposal; that I am able to include the pagination &c. of these papers is due to the kind assistance of Mr. A. S. Hirst; only the title of the paper numbered 2 *b* may be regarded as doubtful (*cf.* Balzan, 10).

1.* P. GERVAIS in C. GAY—Historia fisica y politica de Chile. Zoologia, iv. (1849). "Arachnidos quelifereos," pp. 10–13, pl. i. fig. 13.

2 *a*.* E. L. HOLMBERG.—"Descriptions et notices d'Arachnides de la République Argentine." Period. Zool. Argent. 1874, i. pp. 283–302, pl. vi.

2 *b*.* E. L. HOLMBERG.—"Aracnidos Argentinos." An. de Agricultura Buenos Aires, t. IV. (1876).

3.* T. THORELL.—"Sobre algunos Aracnidos de la republica Argentine." Period. Zool. Argent. 1875, ii. pp. 201–218.

4. Ö. TÖMÖSVÁRY.—"Pseudoscorpiones Faunæ Hungaricæ. A Magyar Fauna Alskorpiói." Magyar tudományos Akadémia Math. és Termeszettud Közlemények. Budapest, vol. xviii. (1882) pp. 135–256, tab. i.–iv.

5. Ö. TÖMÖSVÁRY.—"Adatok az Alskorpiok ismeretéhez." Termés. Füzetek, vol. viii. (1884) pp. 16–27, tab. i.

6.* E. SIMON.—"Arachnides rec. par la Mission du Cap Horn." Mission scientifique du Cap Horn, 1882–1883. T. vi. Zoologie. Paris (1887), 42 pp.

7.* L. BALZAN.—Chernetidæ nonnullæ Sud-Americanæ. Asuncion, Paraguay, pug. i.–ii. 1887; pug. iii. 1888 (no pagination).

8. E. v. DADAY.—"Übersicht der Chernetiden des ungarischen Nationalmuseums in Budapest." Termés. Füz. vol. xi. (1889) pp. 165–192, tab. iv.

9. E. v. DADAY.—"Egy braziliai új Álskorpiógaj a magyar nemzeti museum állattárában." Termés. Füz. vol. xii. (1889).

10. L. Balzan.—"Revisione dei Pseudoscorpioni del Bacino dei Fiumi, Paranà e Paraguay nell' America meridionale." Ann. Mus. Civico Stor. natur. Genova, ser. 2, vol. ix. (1890) pp. 401–454, tavv. xiii.–xvii.

11. L. Balzan.—"Chernetes (Pseudoscorpiones). Voyage de M. E. Simon au Venezuela." Ann. Soc. Ent. vol. lx. (1891) pp. 497–552, pls. 9–12.

12. E. Simon.—"Arachnides rec. à la Terre de Feu par C. Backhausen." Anales del Museo Nacional de Buenos Aires, t. iv. (1895) pp. 167–172.

13. A. Tullgren.—"Two new Species of Chelonethi (Pseudoscorpions) from America." Entomologisk Tidskrift, Stockholm (1900), pp. 153–156, figs. 1–2.

14.* E. Simon.—Hamburger magalhaensische Sammelreise: Arachnoideen. Hamburg (1902), 47 pp. (Pseudoscorpiones, p. 44).

15. E. Ellingsen.—"Sur la Faune de Pseudoscorpions de l'Equateur." Mém. Soc. Zool. France, t. xv. (1902) pp. 146–168.

16. E. Ellingsen.—"On some Pseudoscorpions from Patagonia collected by Dr. F. Silvestri." Boll. Mus. Zool. ed Anat. comp. di Torino, vol. xix. n. 480 (1904), pp. 1–7.

17. E. Ellingsen.—"Pseudoscorpiones viaggio dell Dr. Enrico Festa nell' Ecuador e regioni Vicine. XIX." Boll. Mus. Zool. ed Anat. comp. di Torino, vol. xx. n. 497 (1905), pp. 1–3.

18. E. Ellingsen.—"Pseudoscorpions from South America collected by Dr. A. Borelli, A. Bertoni de Winkelried, and Prof. Goeldi." Boll. Mus. Zool. ed Anat. comp. di Torino, vol. xx. n. 500 (1905), pp. 1–17.

19. E. Ellingsen.—"On some Pseudoscorpions from South America in the Collection of Prof. Dr. F. Silvestri." Zool. Anz., Bd. xxix. No. 10 (1905), pp. 323–328.

20. C. J. With.—"III. Chelonethi. An Account of the Indian False-Scorpions, together with Studies on the Anatomy and Classification of the Order." The Danish Expedition to Siam, 1899–1900. D. Kgl. Danske Vidensk. Selsk. Skrifter, 7 Række, Naturvidenskab. og Mathem. Afd. iii. 1 (1906), pp. 1–214, figs. 1–24, tab. i.–iv.

21. C. J. With.—"On Chelonethi, chiefly from the Australian Region, in the Collection of the British Museum, with Observations on the Coxal Sac and on some Cases of Abnormal Segmentation." Ann. Mag. Nat. Hist. (7) xv. (1905) pp. 94–143, pls. vi.–x.

22. C. J. With.—"On some New Species of *Cheliferinæ* Hans. and *Garypidæ* Hans. in the British Museum." Journ. Linn. Soc., Zool. vol. xxx. (London, 1907), pp. 49–85, pls. 8–10.

23. A. Tullgren.—"Sur Kenntnis Aussereuropaïscher Chelonethiden des Naturhistorischen Museums in Hamburg." Mitteilungen aus dem Naturhistorischen Museum, xxiv. (1907) pp. 21–75, taf. i–v.

24. A. Tullgren.—Über einige exotische Chelonethiden." Entomologisk Tidskrift, Stockholm (1908), pp. 57–64.

PLATE XXIX.

PLATE XXIX.

1. *Chelifer imperator*, sp. n.

Fig. 1 *a*. ♂. Left side of abdomen observed from beneath in a somewhat oblique position, × 24 : 1, first abdominal tergite; 10, tenth abdominal tergite.

1 *b*. ♂. Lower surface of anterior portion of body, showing widely gaping genital opening, × 33 : *o*, entrance-opening to coxal sac; *s*, coxal spine; *st'*, first stigma; *r*, ram's-horn-shaped organ, the left part of which extends somewhat beyond opening.

1 *c*. ♂. Left palp, × 13·5.

1 *d*. ♂. Left chela in anterior view, × 24.

1 *e*. ♂. Left leg I. in anterior view, × 33.

1 *f*. ♂. Tip of left leg I. in anterior view, × 200 : *hi*, anterior subterminal hair; *he*, posterior subterminal hair; *ci*, anterior claw; *cex*, posterior claw.

1 *g*. ♀. Left palp, × 17·5.

1 *h*. ♀. Right chela in posterior view, × 24.

1 *i*. ♀. Two posterior pairs of coxæ, × 33.

2. *Chelifer rex*, sp. n.

Fig. 2 *a*. ♂. Left palp, × 17·5.

2 *b*. ♂. Right chela of palps in almost anterior view, × 77 : *pd*, *pv*, and *pi*, cf. text.

2 *c*. ♂. Right chela of palps in almost posterior view, × 44.

2 *d*. ♂. Coxæ, × 44 : *s*, rudiment of coxal spine; *co*, coxal sac.

2 *e*. ♂. Left tarsus of first pair in anterior view, × 117 : *hi*, anterior subterminal hair; *cex*, posterior claw.

3. *Chelifer rufus* Balz.

Fig. 3 *a*. ♂. Seventh to ninth sternites showing spinous areas, × 77 : VII.–IX., corresponding sternites.

3 *b*. ♂. Right chela in posterior view, × 44.

3 *c*. ♂. Left leg I. in anterior view, × 57.

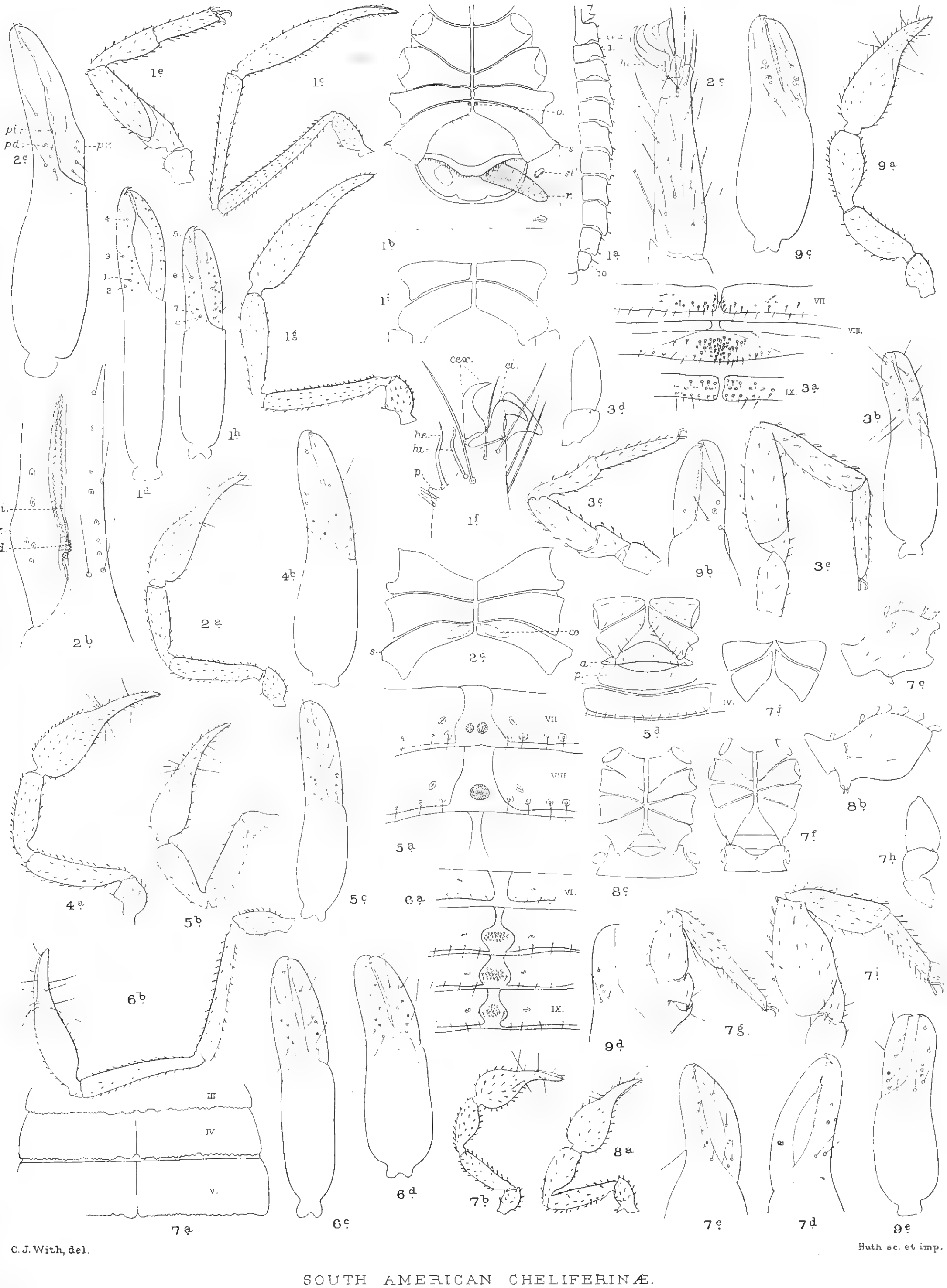
3 *d*. ♂. Femur of left leg I. in posterior view, × 57.

3 *e*. ♂. Left leg IV. in anterior view, × 57.

4. *Chelifer nobilis*, sp. n.

Fig. 4 *a*. ♂. Left palp, × 24.

4 *b*. ♂. Right chela, × 44.



C. J. With, del.

Huth sc. et imp.

SOUTH AMERICAN CHELIFERINÆ.

5. *Chelifer canestrinii* Balz.

Fig. 5 *a*. ♂. The seventh and eighth sternites, × 115: VII. and VIII., corresponding sternites.
5 *b*. ♂. Left palp, × 30.
5 *c*. ♂. Right palp in posterior view, × 44.
5 *d*. ♂. Coxæ and sexual area: *a* and *p*, anterior and posterior plates; IV., fourth sternite.

6. *Chelifer longichelifer* Balz.

Fig. 6 *a*. ♂. Sixth to ninth sternites, × 77: VI. and IX., corresponding sternites.
6 *b*. ♂. Left palp, × 20.
6 *c*. ♂. Right chela in posterior view, × 44.
6 *d*. ♀. Right chela in posterior view, × 44.

7. *Chelifer segmentidentatus* Balz.

Fig. 7 *a*. ♂. The third to the fifth abdominal tergites, × c. 80: III.–V., corresponding tergites.
7 *b*. ♂. Left palp, × 24.
7 *c*. ♂. Trochanter of left palp from below, × 77.
7 *d*. ♂. Right chela in anterior view, × c. 50.
7 *e*. ♂. Right chela in posterior view, × c. 50.
7 *f*. ♂. Coxæ and sexual area, × 44.
7 *g*. ♂. Left leg I. in anterior view, × 57.
7 *h*. ♂. Femur of left leg I. in posterior view, × 57.
7 *i*. ♂. Left leg IV. in anterior view, × 57.
7 *j*. ♀. Last two pairs of coxæ, × 44.

8. *Chelifer satanas*, sp. n.

Fig. 8 *a*. ♂. Left palp, × 24.
8 *b*. ♂. Trochanter of left palp from below, × 77.
8 *c*. ♂. Coxæ and genital area, × 44.

9. *Chelifer insignis*, sp. n.

Fig. 9 *a*. ♀. Left palp, × 24.
9 *b*. ♀. Right chela in anterior view, × 44.
9 *c*. ♀. Right chela in posterior view, × 44.
9 *d*. ♀ var. Left chela in anterior view, × 35.
9 *e*. ♀ var. Left chela in posterior view, × 35.

PLATE XXX.

PLATE XXX.

10. *Chelifer rudis* Balz.

Fig. 10 *a*. ♂. Left chela in anterior view, × 24.
10 *b*. ♂. Left chela in posterior view.
10 *c*. ♀. Cucullus, × 44.
10 *d*. ♀. Right palp, × 13·5.
10 *e*. ♀. Coxæ, × 24.
10 *f*. ♀. Left leg I. in anterior view, × 33.

11. *Chelifer subgracilis*, sp. n.

Fig. 11 *a*. ♀. Left palp, × 17·5.
11 *b*. ♀. Right chela in anterior view, × 33.

12. *Chelifer subrobustus* Balz.

Fig. 12 *a*. ♀? Left chela in anterior view, × 44.
12 *b*. ♀? Left chela in posterior view, × 44.

13. *Chelifer antillarum*, sp. n.

Fig. 13 *a*. ♀. Left palp, × 44.
13 *b*. ♀. Right chela in exterior view, × 77.

14. *Chelifer subrudis* Balz.

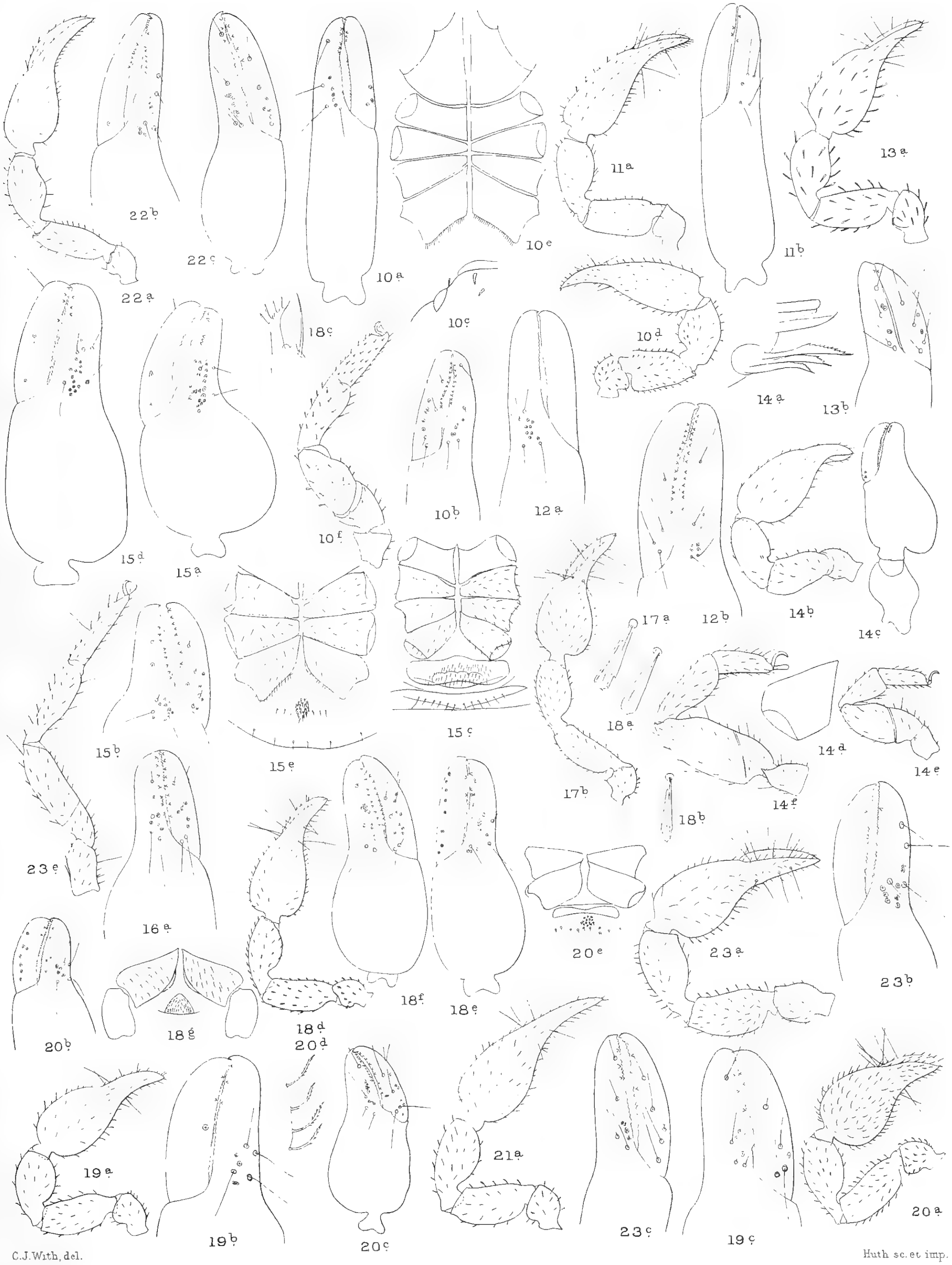
Fig. 14 *a*. ♀. Flagellum and three basal teeth of serrula, × 200.
14 *b*. ♀. Left palp, × 17·5.
14 *c*. ♀. Chela and tibia of right palp in anterior view, × 17·5.
14 *d*. ♀. Right coxa IV., × 44.
14 *e*. ♀. Left leg I. in anterior view, × 29.
14 *f*. ♀. Left leg IV. in posterior view, × 29.

15. *Chelifer bicolor* Balz.

Fig. 15 *a*. ♂. Chela of right palp in anterior view, × 44.
15 *b*. ♂. Chela of right palp in posterior view, × 44.
15 *c*. ♂. Coxæ and genital area, × 28.
15 *d*. ♀. Chela of right palp in posterior view, × 44.
15 *e*. ♀. Coxæ and genital area, × 28.

16. *Chelifer albomaculatus* Balz.

Fig. 16 *a*. ♂. Chela of right palp in posterior view, × 44.



C. J. With, del.

Huth sc. et imp.

SOUTH AMERICAN CHELIFERINÆ.

17. *Chelifer crassimanus* Balz.

Fig. 17 *a*. ♀. Hair of tenth tergite, × 200.
17 *b*. ♀. Left palp, × 17·5.

18. *Chelifer meinertii*, sp. n.

Fig. 18 *a*. ♀. Hair of tenth abdominal tergite, × 200.
18 *b*. ♀. Hair of eleventh abdominal tergite, × 200.
18 *c*. ♀. Left galea, × 200.
18 *d*. ♀. Left palp, × 24.
18 *e*. ♀. Chela of right palp in anterior view, × 44.
18 *f*. ♀. Chela of right palp in posterior view, × 44.
18 *g*. ♀. Fourth pair of coxæ, × 44.

19. *Chelifer subrotundatus* Balz.

Fig. 19 *a*. ♀. Left palp, × 44.
19 *b*. ♀. Chela of right palp in anterior view, × 77.
19 *c*. ♀. Chela of right palp in posterior view, × 77.

20. *Chelifer plumosus*, sp. n.

Fig. 20 *a*. ♀. Left palp, × 33.
20 *b*. ♀. Chela of right palp in anterior view, × 44.
20 *c*. ♀. Chela of right palp in posterior view, × 44.
20 *d*. ♀. Hairs of anterior surface of hand, × 110.
20 *e*. ♀. Fourth pair of coxa and genital area, × 44.

21. *Chelifer nitidimanus* Ell.

Fig. 21 *a*. ♀. Left palp, × 44.

22. *Chelifer michaelsenii* Sim.

Fig. 22 *a*. ♂. Left palp, × 24.
22 *b*. ♂. Chela of right palp in anterior view, × 44.
22 *c*. ♂. Chela of right palp in posterior view, × 44.

23. *Chelifer celerrimus*, sp. n.

Fig. 23 *a*. ♀. Left palp, × 44.
23 *b*. ♀. Chela of right palp in anterior view, × 77.
23 *c*. ♀. Chela of right palp in posterior view, × 77.
23 *e*. ♀. Left leg IV. in anterior view, × 57.

PLATE XXXI.

PLATE XXXI.

23. *Chelifer celerrimus*, sp. n.

Fig. 23 *d*. ♀. Left leg I. in anterior view, × 57.

24. *Chelifer* sp. Young.

Fig. 24 *a*. Chela of right palp in posterior view, × 44.

25. *Chelifer ellingsenii*.

Fig. 25 *a*. ♀. Left palp, × 17·5.
25 *b*. ♀. Chela of right palp in anterior view, × 44.
25 *c*. ♀. Chela of right palp in posterior view, × 44.
25 *d*. ♀. Left leg I. in anterior view, × 33.
25 *e*. ♀. Left leg IV. in posterior view, × 33.

26. *Chelifer subovatus*, sp. n.

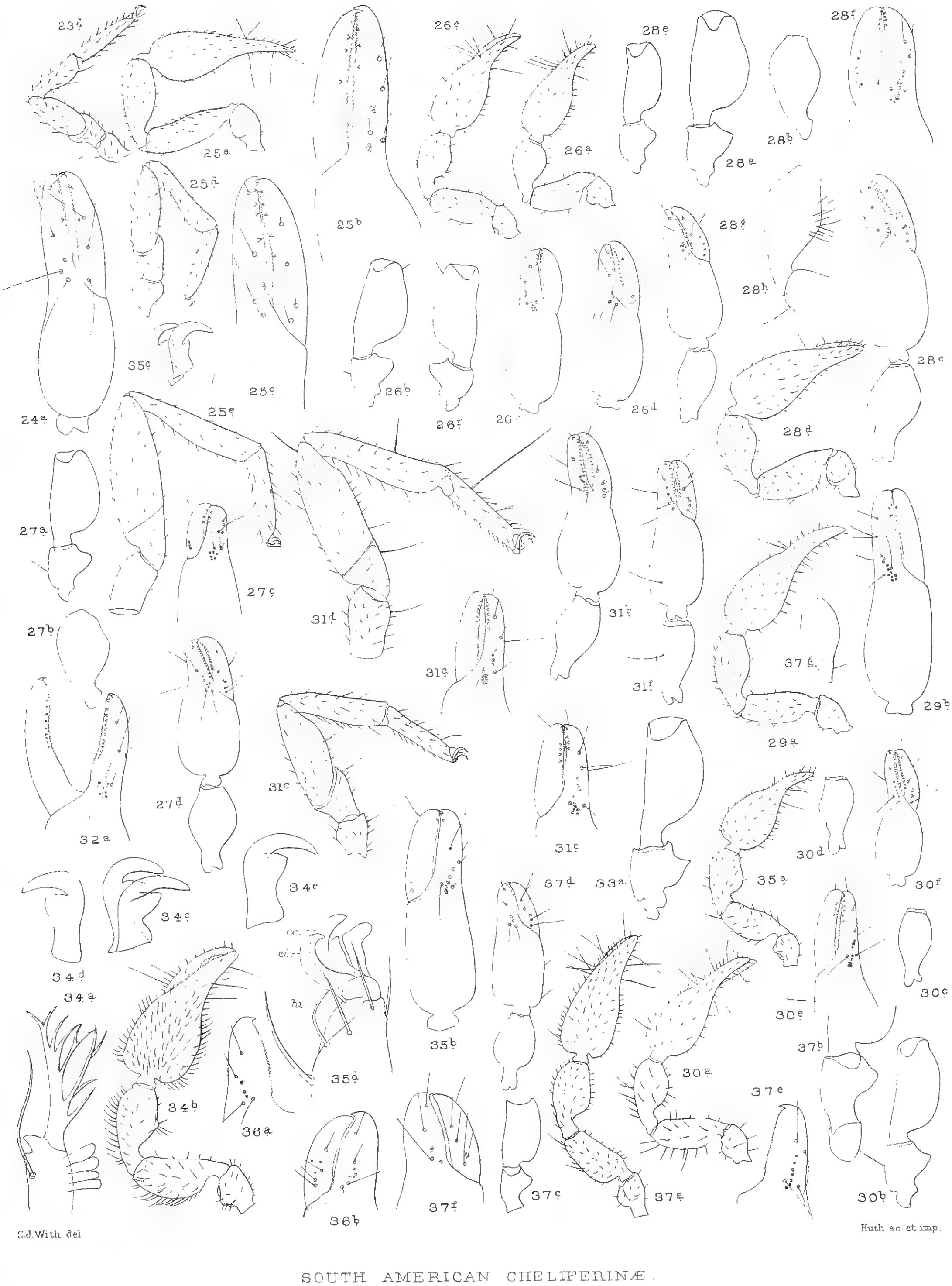
Fig. 26 *a*. ♂. Left palp, × 17·5.
26 *b*. ♂. Trochanter and femur of right palp in anterior view, × 24
26 *c*. ♂. Chela of left palp in anterior view, × 24.
26 *d*. ♂. Chela of right palp in posterior view, × 24.
26 *e*. ♀. Left palp, × 17·5.
26 *f*. ♀. Trochanter and femur of left palp in anterior view, × 24.

27. *Chelifer intermedius* Balz.

Fig. 27 *a*. ♂. Trochanter and femur of right palp in anterior view, × 24.
27 *b*. ♂. Left tibia of palp, × 24.
27 *c*. ♂. Chela of right palp in anterior view, × 24.
27 *d*. ♂. Tibia and chela of right palp in posterior view, × 24.

28. *Chelifer communis* Balz.

Fig. 28 *a*. ♂. Trochanter and femur of right palp in anterior view, × 24.
28 *b*. ♂. Tibia of left palp, × 24.
28 *c*. ♂. Tibia and chela of right palp in posterior view, × 24.
28 *d*. ♀. Left palp, × 24.
28 *e*. ♀. Trochanter and femur of right palp in anterior view, × 24.
28 *f*. ♀. Fingers of right palp in anterior view, × 44.
28 *g*. ♀. Tibia and chela of right palp in posterior view, × 24.
28 *h*. ♂. Ellingsen's original specimen. Tibia of left palp, × 24.



C.J. With del.

Huth sc et imp.

SOUTH AMERICAN CHELIFERINÆ.

29. *Chelifer nitidus* Ell.

Fig. 29 *a*. ♀. Left palp, × 24.
29 *b*. ♀. Chela of left palp in anterior view, × 37.

30. *Chelifer similis* Balz.

Fig. 30 *a*. ♂. Left palp, × 17·5.
30 *b*. ♂. Trochanter and femur of right palp in anterior view, × 24.
30 *c*. ♂. Tibia of right palp in posterior view, × 17·5.
30 *d*. ♂. Tibia of right palp in posterior, partly dorsal view, × 17·5.
30 *e*. ♂. Chela of right palp in anterior view, × 24.
30 *f*. ♂. Chela of right palp in posterior view, × 17·5.

31. *Chelifer argentinus* Thor.

Fig. 31 *a*. ♂. Fingers of right palp in anterior view, × 24.
31 *b*. ♂. Tibia and chela of right palp in posterior view, × 17·5.
31 *c*. ♂. Left leg I. in anterior view, × 37.
31 *d*. ♂. Left leg IV. in anterior view, × 37.
31 *e*. ♀. Fingers of right palp in anterior view, × 24.
31 *f*. ♀. Tibia and chela of right palp in posterior view, × 24.

32. *Chelifer macrochelatus* Töm.

Fig. 32 *a*. ♂. Fingers of right palp in anterior view, × 24.

33. *Chelifer nodulimanus* Töm.

Fig. 33 *a*. ♂. Trochanter and femur of right palp in anterior view, × 13·5.

34. *Chelifer cervus* Balz.

Fig. 34 *a*. ♂. Left galea, × 135.
34 *b*. ♂. Left palp, × 12.
34 *c*. ♂. Claws of first pair of left legs, × 144.
34 *d*. ♂. Posterior claw of left leg I. in posterior view, × 144.
34 *e*. ♂. Posterior claw of left leg IV. in anterior view, × 144.

35. *Chelifer depressimanus*, sp. n.

Fig. 35 *a*. ♀. Left palp, × 19.
35 *b*. ♀. Chela of right palp in anterior view, × 44.
35 *c*. ♀. Claws of left leg I., × 144.
35 *d*. ♀. Left tarsus IV. in anterior view, × 183 : *ci*, anterior claw ; *ce*, posterior claw ; *hi*, anterior subterminal hair.

36. *Chelifer nidificator* Balz.

Fig. 36 *a*. ♂. Finger of left palp in anterior view, × 37.
36 *b*. ♂. Fingers of left palp in posterior view, × 37.

37. *Chelifer elongatus* Ell.

Fig. 37 *a*. ♀. Left palp, × 24.
37 *b*. ♀. Trochanter of right palp in anterior view, × 44.
37 *c*. ♀. Trochanter and femur of right palp in anterior view, × 24.
37 *d*. ♀. Tibia and chela of right palp in posterior view, × 24.
37 *e*. ♀. Immovable finger of right palp in anterior view, × 44.
37 *f*. ♀. Fingers of right palp in posterior view, × 44.
37 *g*. ♂. (Ellingsen's specimen.) Tibia of right palp, × 24; not in complete dorsal view.

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October, 1908.

P. CHALMERS MITCHELL,
Secretary.

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OF

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(PLATES XXXII.-XXXVII.)

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Continued on page 3 of Wrapper.

IV. *On New or Rare Crustacea of the Order Cumacea from the Collection of the Copenhagen Museum.*—Part II. *The Families* Nannastacidæ *and* Diastylidæ.

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[Plates XXXII.–XXXVII.]

In this, the second and concluding part † of a report on Cumacea from the Zoological Museum of Copenhagen, twenty-nine species are dealt with, all except two of which are regarded as new, and three new genera are established. As in the case of the specimens dealt with in Part I., the authorities of the Copenhagen Museum have courteously allowed a selection of those here described to be retained for the British Museum.

List of the Species dealt with in this Paper.

Family Nannastacidæ.

Cumella forficula, sp. n.	Gulf of Siam.
,, *clavicauda*, sp. n.	West Indies.
,, *leptopus*, sp. n.	,,
,, *hispida*, sp. n.	Gulf of Siam.
,, *serrata*, sp. n.	West Indies.
,, *lævis*, sp. n.	Gulf of Siam.
Nannastacus lepturus, sp. n.	Suez.
,, *zimmeri*, sp. n.	Ceylon.
,, *gibbosus*, sp. n.	Gulf of Siam.
,, *reptans*, sp. n.	,,
,, *minor*, sp. n.	,,
,, *tardus*, sp. n.	,,
,, *agnatus*, sp. n.	,,
Schizotrema depressum, gen. et sp. n.	,,
,, *bifrons*, sp. n.	India.
,, *sordidum*, sp. n.	Gulf of Siam.
Campylaspis platyuropus, sp. n.	,,
,, *orientalis*, sp. n.	Korea.

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† For Part I., see Trans. Zool. Soc. xviii. pt. i. No. 1 (1907).

Family Diastylidæ.

Gynodiastylis carinata, gen. et sp. n.	New Zealand.	
,, *lævis*, sp. n.	,,	
,, *costata*, sp. n.	Gulf of Siam.	
,, *bicristata*, sp. n.	,,	and Japan.
Paradiastylis longipes Calm.	,,	
Colurostylis pseudocuma, gen. et sp. n.	New Zealand.	
Diastylopsis elongata, sp. n.	,,	
,, *crassior*, sp. n.	,,	
Diastylis koreana, sp. n.	Korea.	
,, *fistularis*, sp. n.	Gulf of Siam.	
,, *insularum* Calm.	New Zealand.	

It is not pretended that this list, with that published in the first part of the paper, accounts for every specimen in the collections submitted to me. A certain number remain over which may represent undescribed species, but they are solitary, immature, or mutilated specimens, undistinguished by any striking features, and descriptions of them, necessarily incomplete, would only add to the perplexities of future students of the group. In addition, there are a considerable number of male specimens of the genera *Cumella* and *Nannastacus* which, as explained below, have so far defied my efforts to reduce them to systematic order.

In working through this very extensive collection, together with other collections from tropical and southern seas reported on elsewhere, the infrequency with which known species have been recognized has been very striking. We seem to be dealing only with random samples from a very rich and varied fauna, and there can be little doubt that the vast majority of existing species of Cumacea still remain to be discovered. While the group is far more abundantly represented in tropical seas than had been supposed, much more extensive collecting will be necessary before it is possible to compare the number of species with those found in boreal and arctic waters; certainly the warmer seas have nowhere been found, as yet, to yield the enormous numbers of individuals occurring, for instance, in favourable localities on the Norwegian coast; and, as in many other groups of animals, the tropical species are far inferior in size to those from the colder regions of the north.

The manifest imperfections of our knowledge make it useless to attempt at present any general discussion of the geographical distribution of the Cumacea. Provisionally, however, it may be said that the collections hitherto examined show a remarkable preponderance, in the warmer seas, of the Bodotriidæ (especially the genus *Cyclaspis*) and Nannastacidæ (especially *Cumella* and *Nannastacus*) and a paucity of Diastylidæ and Leuconidæ. Further south, in New Zealand, as in the Magellan and other sub-antarctic regions, and in the Antarctic Ocean, the Diastylidæ and Leuconidæ reassert themselves.

From the point of view of the general taxonomy and phylogeny of the Crustacea the results of recent additions to our knowledge of the Cumacea are disappointing. Not one of the new genera which have been described perceptibly extends the group towards any of the adjacent Orders of the Malacostraca. The separation of the branchial orifices in *Zygosiphon* and *Schizotrema* might perhaps be thought to take us a little way back in the direction of the Mysidacea, but it is more likely to be a secondary modification than a primitive character; and although *Ceratocuma* in its free telson and full series of pleopods unites two characters, presumably primitive, not elsewhere found in combination, it is in all other respects a specialized type. The Cumacea still remain a sharply circumscribed group, and although it is as certain as anything of the sort can well be that they have been derived from a Mysidacean-like ancestral form and that their line of descent travelled for some little way along with that of the Tanaidacea and Isopoda (but not, probably, with that of the Amphipoda), none of the intermediate links appear to have survived.

It was to be expected that the classification of the Cumacea, established by Sars almost entirely from a study of northern species, would require modification as a result of the discovery of so many new species from other seas. As usually happens in such cases, the diagnoses of existing families have to be greatly modified if they are to admit the new forms, and the limits between the families become harder and harder to recognize. I have elsewhere proposed the union of the Campylaspidæ with the Nannastacidæ, and have commented on the increasing difficulty of keeping the Vauntompsoniidæ apart from the Bodotriidæ and the Diastylidæ from the Lampropidæ. The new genus *Colurostylis* described below similarly helps to bridge the gap between the Diastylidæ and Pseudocumidæ. In many cases characters hitherto relied on for the separation of families—such as the number of thoracic exopods or of pleopods—have proved to be of not more than generic value, and in the case of some of the species of *Nannastacus* described below I have been led to suspect that the number of thoracic exopods may not be even a specific character. Whether it will be possible to group the genera of the order in a smaller number of natural and sharply defined families is a problem which must be left for the future. It is at least as likely that it will be necessary, as it has been in the case of the Gammaridean Amphipods, to establish a much larger number of families and to be content to define these by more trivial characters. At the present moment, however, any attempt at a re-classification could only be of the most provisional nature, and I have therefore preserved, where possible, the existing families, with such extensions as are necessary to admit the new forms.

In the descriptions which follow, the measurement of "total length" includes the telson (when distinct) but not the uropods. As it is often impossible to straighten out the abdomen without the risk of damage to the specimen, it is difficult to obtain accurate measurements, and the figures given must be regarded only as approximate.

Family NANNASTACIDÆ.

Genus Cumella.

In addition to the specimens described below there are in the collection a number of males of this genus, collected, for the most part, by Dr. Mortensen in the Gulf of Siam, which I am unable to identify with any described species or to allot to any of the females found with them. As in the case of the genus *Nannastacus,* I do not attempt to describe these males.

Key to the Species of Cumella (excluding *C. molossa* Zimmer, not yet figured, but described as closely resembling *C. gracillima*).

A. Last somite inflated, longer than the preceding.
- a. Legs of last pair about as long as carapace, carpus more than twice as long as merus; pseudorostrum long . . . . *C. forficula,* sp. n.
- b. Legs of last pair two-thirds as long as carapace, carpus less than twice as long as merus; pseudorostrum very short . . . . . *C. clavicauda,* sp. n.

B. Last somite not inflated, not longer than the preceding.
- a. Peduncle of uropods more than twice as long as last somite; carpus of last leg more than three times as long as merus.
  - *A.* Carapace one-fourth of total length; pseudorostrum well-developed; eye absent; antennal flagellum of male not longer than thorax . . . . *C. gracillima* Calman.
  - *B.* Carapace one-third of total length; pseudorostrum very short; eye present; antennal flagellum of male nearly equal to length of body . . . . *C. leptopus,* sp. n.
- b. Peduncle of uropods less than twice as long as last somite.
  - *A.* Last somite about equal in length to the preceding; carpus of last leg three times as long as merus; peduncle of uropods distinctly shorter than last somite . . . . *C. hispida,* sp. n.
  - *B.* Last somite distinctly shorter than preceding; carpus of last leg less than three times as long as merus; peduncle of uropods about equal to or longer than last somite.
    - *a.* Carpus of last leg more than twice as long as merus . . . . *C. serrata,* sp. n.
    - *b.* Carpus of last leg less than twice as long as merus.
      - a′. Antero-lateral margin of carapace deeply concave, the lower angle prominent.
        1. Third free somite with double dorsal tooth (female) . . *C. australis* Calman.
        2. Third free somite without dorsal tooth . . . . *C. pygmæa* G. O. Sars.
      - b′. Antero-lateral margin of carapace straight, the lower angle with a small tooth.
        1. Rami of uropods subequal . . . . *C. lævis,* sp. n.
        2. Exopodite of uropods shorter than endopodite . . . . *C. limicola* G. O. Sars.

Cumella forficula, sp. n. (Plate XXXII. figs. 1–6.)

Description of adult Female.—Total length 1·7 mm.

Carapace a little less than one-third of total length, compressed, its depth more than half of its length. The dorsal edge is sinuous, concave in its posterior part, convex anteriorly, and with a small convexity just in front of the hinder margin; commonly, each of these convexities bears a curved spine, but sometimes only the anterior spine is present. The ocular lobe is prominent on the dorsal surface and the eye is well pigmented. The pseudorostrum is long, directed slightly upwards, and acutely pointed; the lateral plates meet in front of the ocular lobe for a distance greater than the diameter of the lobe. The straight antero-lateral margin slopes backwards and the obtuse antero-lateral angle bears a single minute tooth. The surface of the carapace, as of the rest of the body, bears a number of scattered hairs.

The abdomen is but little shorter than the cephalothoracic region. The last somite is of peculiar form; it is longer than the preceding somite and, as seen from the side, it is inflated, with arched upper and under surfaces; seen from above, it increases in width posteriorly and is produced as a rounded lobe for some distance between the bases of the uropods.

The antennules are slender, resembling in proportions those of *C. limicola*, but the unsegmented inner flagellum is still more minute.

The mouth-parts appear to differ only in trivial details from those of the type of the genus.

The first legs resemble those of *C. limicola*, but have the basis relatively a little shorter, less than two-thirds as long as the remaining segments. In the second legs the basis is a little less than two-thirds as long as the remaining segments, while that of *C. limicola* is distinctly more.

The remaining legs are much more slender and have the carpus more elongated than in *C. limicola*. Those of the last pair are about as long as the carapace and have the carpus more than twice as long as the merus and four-fifths as long as the basis.

The uropods are very short, their greatest length to the tip of the terminal spines being less than that of the last somite. The peduncle is less than half as long as the last somite, tapers a little distally, and is hardly more than twice as long as its greatest width. The rami, especially the endopodites, are curved inwards like the tail-forceps of an earwig. The terminal spines are indistinctly defined from the rami, but to the tip of its spine the endopodite is a little longer than and the exopodite equal to the peduncle. There are two spinules on the inner edge of the endopodite and a few setæ on that of the peduncle.

Adult Male.—Total length 1·85 mm.

The body is a little more slender and elongated than in the female, the depth of the carapace being less than half its length. There are no spines on the carapace and the inequality of the dorsal surface is less marked. The eye is very large, with large and prominent corneal lenses. The pseudorostrum is shorter than in the female and its upper edge is concave. The antero-lateral margin is very short and the angle has no tooth. The last somite of the abdomen is inflated as in the female. The antennal flagella are nearly or quite as long as the body and the lateral grooves are well-marked on all the abdominal somites except the last.

The proportions of most of the appendages are much as in the female, but the uropods are longer; their length to the tip of the terminal spines is greater than that of the last somite. The peduncle is more than half as long as the last somite and nearly three times as long as its greatest width. There are four spinules on the inner edge of the endopodite and five spinules interspersed with fine setæ on that of the peduncle.

Occurrence.—Gulf of Siam, "Koh Kam, 5–10 fathoms, 4–6/2/00," "Between Koh Mesan and Cape Liant, 5–8 fathoms, 7/2/00," "North side of Koh Chang, 1 fathom, 3/3/00." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

CUMELLA CLAVICAUDA, sp. n. (Plate XXXII. figs. 7–10.)

Description of adult Male.—Total length 1·9 mm.

Carapace less than one-third of total length, its depth more than half of its length. Dorsal edge slightly sinuous, without spines. The eye is very large, with about nine large corneal lenses, of which one is in the middle line in front; in all the specimens examined the eye-pigment is aggregated into a pair of small lateral spots, so that under a low magnification the eye appears to be paired and the animal is apt to be mistaken for a species of *Nannastacus*. The pseudorostrum is very short, the lateral plates hardly meeting, if at all, in front of the ocular lobe and forming a pair of small tooth-like prominences when the carapace is viewed from above. The antero-lateral margin is short and nearly straight and the angle is rounded off. As in *C. forficula*, the last abdominal somite is longer than the preceding and inflated as seen from the side; seen from above it increases in width posteriorly, but the hinder edge is broadly convex and hardly produced between the bases of the uropods. The lateral groove is distinct only on the first four abdominal somites and the antennal flagellum is of a corresponding length.

The antennules have the peduncle shorter and stouter than in *C. forficula*, the inner flagellum minute and unsegmented.

The basis of the first legs is much more than two-thirds as long as the remaining segments.

The posterior legs are relatively short; those of the last pair are little more than two-thirds as long as the carapace and have the carpus about one and a half times as long as the merus and little more than half as long as the basis.

The uropods are similar to those of *C. forficula.* The greatest length to the tip of the terminal spine is about one-third more than that of the last somite. The peduncle is about two-thirds as long as the last somite and not much more than twice as long as its greatest width. The endopodite is not quite so much curved as in *C. forficula* and the exopodite is nearly straight. There are four spinules on the inner edge of the endopodite, and about six, interspersed with fine setæ, on that of the peduncle.

Occurrence.—"Cruz Bay, St. Jan" (Danish West Indies). Chr. Levinsen Coll., Copenhagen Museum. Co-types in British Museum.

CUMELLA LEPTOPUS, sp. n. (Plate XXXII. figs. 11–14.)

Description of adult Male.—Total length 2·2 mm.

Carapace about one-third of total length, its depth a little more than half of its length. Dorsal edge very slightly sinuous, without spines. The eye is very large, with about seven large and prominent corneal lenses, of which one is in the middle line in front of the ocular lobe; in all the specimens examined the eyes are without conspicuous pigment. The pseudorostrum is practically obsolete, the lateral plates apparently not meeting in front of the ocular lobe. The antero-lateral margin is concave, and the angle, which is slightly prominent, is rounded. The last somite of the abdomen is less than two-thirds as long as the preceding, and is produced and pointed posteriorly. The lateral grooves are distinct on all the abdominal somites except the last and the antennal flagellum is about as long as the body.

The antennules have the peduncle rather slender, the last segment being about three times as long as thick, and the inner flagellum minute and unsegmented.

The first legs have the basis about equal in length to the remaining segments and the propodus two and a half times as long as the dactylus. The second legs have the distal segments slender, and the carpus more than twice as long as the merus.

The posterior legs are very slender. The last pair are a little shorter than the carapace and have the basis about two-thirds as long as the remaining segments; the carpus is about three-fourths as long as the basis and four times as long as the merus.

The uropods are long and slender; the peduncle is more than twice as long as the last somite and has about nine spines on its inner edge; the endopodite is less than half the length of the peduncle, with a long slender apical spine and six spines on the inner edge; the exopodite is about five-sixths as long as the endopodite and its terminal spine is very long and slender.

Occurrence.—"Cruz Bay, St. Jan" (Danish West Indies). Chr. Levinsen Coll., Copenhagen Museum. Co-type in British Museum.

CUMELLA HISPIDA, sp. n. (Plate XXXII. figs. 15–18.)

Description of adult Female.—Total length 2·55 mm.

Carapace a little less than one-third of total length, its depth about half its length. Dorsal edge slightly arched, with a shallow depression in front of the hinder margin and two teeth in front of the middle. The ocular lobe is prominent on the dorsal surface and the eye is pigmented. The pseudorostrum is long, directed obliquely upwards, and acutely pointed; the lateral plates meet in front of the ocular lobe for a distance much greater than the diameter of the lobe. The antero-lateral margin is concave and the lower corner is nearly rectangular. The surface of the carapace and of the rest of the body bears rather numerous scattered hairs.

The abdomen is a little shorter than the cephalothorax. The last somite is about equal in length to the preceding, not inflated; seen from above it increases only slightly in width posteriorly, and is produced as a broad rounded lobe for some distance between the bases of the uropods.

The antennules have the peduncle rather slender, the last segment being more than three times as long as thick, and the inner flagellum minute and unsegmented.

The first legs have the basis a little less than two-thirds as long as the remaining segments; that of the second legs is about two-thirds as long as the remaining segments.

The remaining legs are slender; the last pair are a little shorter than the carapace and have the carpus three times as long as the merus and four-fifths as long as the basis.

The uropods have the peduncle about three-fourths as long as the last somite. The straight endopodite, together with the terminal spine which is indistinctly marked off from it, measures a little more than the length of the peduncle and is longer by one-fourth than the exopodite. There are two spinules on the inner edge of the endopodite and two on that of the peduncle.

Occurrence.—Gulf of Siam, "Koh Kam, 5 fathoms, 6/2/00." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

CUMELLA SERRATA, sp. n. (Plate XXXII. figs. 19–24.)

Description of adult Female.—Total length 2·2 mm.

Carapace less than one-third of total length, compressed, its depth nearly two-thirds of its length. The dorsal edge is slightly convex, with about six curved teeth, of which one is set on a prominence just behind a shallow depression and in front of the hind margin. The ocular lobe is prominent on the dorsal surface and is provided with distinct lenses, but without pigment. The pseudorostrum is long, directed obliquely upwards, and acutely pointed; the lateral plates meet in front of the ocular lobe for a distance greater than the diameter of the lobe. The antero-lateral margin is concave and the angle bears an acute tooth. The surface of the carapace and of the rest of the body bears only inconspicuous scattered hairs.

The abdomen is equal in length to the cephalothoracic region. The last somite is shorter than the preceding, not inflated; seen from above it increases slightly in width posteriorly and projects as a rounded lobe for some distance between the bases of the uropods.

The antennules have the last segment of the peduncle about three times as long as thick and a little shorter than the preceding.

The first legs have the basis little more than half as long as the remaining segments; that of the second legs is little shorter than the remaining segments.

The posterior legs are rather slender; the last pair are a little shorter than the carapace and have the carpus more than twice as long as the merus and nearly as long as the basis.

The uropods have the peduncle longer by about one-fourth than the last somite. The endopodite without its stout terminal spine is about two-thirds as long as the peduncle and more than half as long again as the exopodite. There are three spinules on the inner edge of the endopodite and four on that of the peduncle.

Adult Male.—Total length 2·3 mm.

Carapace about one-third of total length, its depth about half its length. The dorsal edge is nearly straight, without teeth. The ocular lobe bears a number of large and prominent lenses, but is without pigment. The pseudorostrum is short, obliquely truncated, with the upper edge slightly concave; the lateral plates meet in front of the ocular lobe for a distance less than the diameter of the lobe. The antero-lateral margin is oblique and the angle is rounded. The surface of the body is without conspicuous hairs.

The abdomen is shorter than the cephalothoracic region. The last somite is shorter than the preceding, not inflated; seen from above it is more than two-thirds as broad as long, increasing slightly in width posteriorly and projecting as a rounded lobe for some distance between the bases of the uropods. The lateral antennal grooves are distinct on all the somites except the last.

The antennules have the last segment of the peduncle about three times as long as thick and distinctly shorter than the preceding. The flagella of the antennæ are about as long as the body.

The proportions of the legs are much as in the female. The last pair are distinctly shorter than the carapace and have the carpus two and a half times as long as the merus and nearly as long as the basis.

The uropods have the peduncle longer by one-half than the last somite. The endopodite, without its terminal spine, is less than two-thirds as long as the peduncle and distinctly more than half as long again as the exopodite. There are six spinules on the inner edge of the endopodite and the same number on that of the peduncle.

Occurrence.—"Cruz Bay, St. Jan (Danish West Indies), 6/96." Chr. Levinsen Coll., Copenhagen Museum. Co-types in British Museum.

Cumella lævis, sp. n. (Plate XXXII. figs. 25–27.)

Description of adult Female.—Total length 1·15 mm.

Carapace a little more than one-third of total length, its depth more than half its length. Dorsal edge horizontal, slightly sinuous, without teeth. The ocular lobe is prominent on the dorsal surface and the eye is pigmented. The pseudorostrum is very short and truncated, the lateral plates meeting in front of the ocular lobe for a distance less than the diameter of the lobe. The straight antero-lateral margin slopes backward and the angle is obtuse and rounded. The surface of the carapace and of the rest of the body is without conspicuous hairs.

The abdomen is shorter than the cephalothoracic region. The last somite is less than two-thirds as long as the preceding, not inflated; seen from above it is little longer than broad and its broadly rounded posterior lobe projects only for a short distance between the bases of the uropods.

The antennules have the peduncle rather stout, the last segment being about two and a half times as long as wide and shorter than the preceding segment; the inner flagellum is minute and unsegmented.

The first legs have the basis about half as long as the remaining segments; that of the second legs is more than two-thirds as long as the remaining segments.

The remaining legs are short and stout; the last pair are little more than two-thirds as long as the carapace and have the carpus about one-half longer than the merus and little more than half as long as the basis.

The uropods have the peduncle nearly twice as long as the last somite. The subequal rami are more than two-thirds as long as the peduncle and each bears a slender terminal spine sharply marked off from it. There are four spines increasing in length distally on the inner edge of the endopodite.

Occurrence.—Gulf of Siam, "Koh Kam, 1–5 fathoms, 1/1/00, 6/2/00," "Between Koh Mesan and Cape Liant, 5–8 fathoms, 7/2/00." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

Genus Nannastacus.

The discrimination of species in this genus presents difficulties which I have not been able altogether to overcome. The collection of the Copenhagen Museum comprises a very large number of specimens of *Nannastacus*, most of which were collected in the Gulf of Siam by Dr. Th. Mortensen. The great majority of these are males resembling in general characters the male of *N. zimmeri* described below, but differing among themselves in size, in the proportions of the uropods and legs, in the relative size of the eyes, and in other small characters. Most of these characters are subject to individual variation, and after dissecting, drawing, and comparing a number of these males I have reluctantly come to the conclusion that it is impossible, at present, to group them under specific names or to pair them with the different forms of females.

In the case of *N. zimmeri*, the single female specimen was found in a gathering containing numerous specimens of the male and no other Cumacea, so that there is every probability that the two sexes do belong to the same species. In the richer gatherings from the Gulf of Siam, however, two or three closely allied types of female frequently occur in the same bottle with numerous males which cannot be satisfactorily distinguished from one another.

The new species of which females are described below (*N. zimmeri*, *N. gibbosus*, *N. reptans*, *N. minor*, *N. tardus*, and *N. agnatus*) differ from the type of the genus (*N. unguiculatus*) in having no exopod on the third maxilliped in that sex, and I find that the female type specimen of *N. suhmii* G. O. Sars agrees with them in this respect. The males of *N. suhmii* and *N. zimmeri*, however, have a well-developed exopod on that appendage, and it may fairly be assumed that the males of the other species will be found to have it also. The absence of this exopod in the female sex is already known in several species of Diastylidæ, and in that family it has been regarded as a distinction of generic value. It might have been so regarded in this case also, were it not for a further peculiarity presented by *N. reptans* and *N. tardus*. The females described under these names differ from all Cumacea hitherto known in having no thoracic exopods at all; they have lost not only that of the third maxilliped, but also those of the first and second legs; and, curiously enough, each of them was accompanied in nearly all the gatherings in which they occurred by another form hardly differing from the first in any character of importance except in possessing exopods on these legs. Both forms are represented by mature ovigerous females, and I have thought it advisable to describe them under distinct specific names, but it must be admitted as quite possible that *N. reptans* may be merely an individual variation or a phase in the life-history of *N. minor*, and that *N. tardus* may stand in the same relation to *N. agnatus*. At all events, the two pairs of species, if they are specifically distinct, can hardly be generically separated; and since the absence of exopods from the first and second legs seems to be a distinction at least as important as the absence of an exopod from the third maxilliped, there is no good reason for giving generic value to the latter character and not to the former.

I formerly gave as one of the distinguishing characters of the genus *Nannastacus* the absence of a distinct ischium in the second maxillipeds (Fisheries, Ireland, Sci. Invest. 1904, i. (1905) p. 23). In some of the species described below I find indications of a separate ischium in this appendage, but as the character is one which it is difficult to verify without undue sacrifice of material I should prefer to omit it from the generic definition.

As many of the species are known only in one sex it is not possible to give a satisfactory key to their arrangement. I have attempted, however, in the remarks appended to the description of each new species to indicate as far as possible its systematic relations.

NANNASTACUS LEPTURUS, sp. n. (Plate XXXIII. figs. 1–3.)

Description of adult Male.—Total length 2·0 mm.

Carapace a little more than one-third of total length, slightly compressed, dorsal margin slightly arched. The pseudorostrum, seen from the side, is short and truncate. Antero-lateral margin concave, forming a widely open antennal notch; antero-lateral angle rounded, hardly produced. Eyes prominent, darkly pigmented, set rather close together, the distance between them not more than one-eighth of the length of the carapace.

The first leg-bearing somite is distinct. The pleural plates of the succeeding thoracic somites are hardly expanded laterally.

The abdomen is nearly equal to the cephalothoracic region. The somites are cylindrical, each with a well-marked lateral groove; the fifth somite is one and a half times as long as the fourth and twice as long as the last, which is truncate posteriorly.

The peduncle of the antennule has the three segments (as seen without dissection) subequal, the second with a short distal process on the upper side, not reaching beyond the end of the segment; both flagella have two segments, and the inner flagellum is a little shorter than the first segment of the outer.

The first legs have a slender dactylus, about two-thirds as long as the propodus.

In the last pair of legs the basis is little more than one-third of the length of the limb, the carpus is less than twice as long as the merus, and one-third longer than the propodus, which again is about equal to the dactylus with its claw.

The peduncle of the uropods is more than twice as long as the last somite, slender, with five spinules on the finely serrated inner edge. The endopod is about half as long as the peduncle, with a terminal spine of less than half its length and seven spines, increasing in length distally, on the inner edge. The exopod is about four-fifths of the length of the endopod and bears a slender terminal spine of its own length.

Remarks.—*N. longirostris* G. O. Sars, *N. brachydactylus* Calman, and the species described above form a group defined from the other species of the genus by having the peduncle of the uropods at least twice as long as the last somite. *N. hirsutus* Hansen, which has the peduncle only about equal to the last somite, agrees with the first two of these species in the length of the pseudorostrum, of which the lateral plates meet above for at least one-sixth of the total length of the carapace. From all these species *N. lepturus* is distinguished by the very short pseudorostrum and by having the abdomen nearly equal to the cephalothoracic region.

Occurrence.—"Suez, 3/1/98, H. Mortensen." Copenhagen Museum.

NANNASTACUS ZIMMERI, sp. n. (Plate XXXIII. figs. 4–15.)

Description of adult Female.—Total length 1·5 mm.

Carapace a little more than one-third of total length, inflated behind, where the width is greater than the depth, much narrowed in front. Seen from the side the dorsal edge is convex, with a slight elevation at the posterior margin bearing a small tubercle; the pseudorostrum is short, directed obliquely upwards, narrowly truncate; antero-lateral margin deeply concave, antero-lateral angle produced into a blunt spine with a few setæ at the apex. Seen from above, the lateral plates of the pseudorostrum meet below but not above the respiratory channel, so that the opening of the latter extends back to the interocular margin; only the tips of the antero-lateral angles project laterally. The eyes are small and darkly pigmented, and the distance between them is about one-fourth of the length of the carapace. The surface of the carapace is smooth, with very minute scattered setæ, and there is a slight depression on each side behind the eye.

The first leg-bearing somite is reduced to a very narrow strip behind the carapace, expanding below into the pleural plates, which, like those of the following somites, are spread out laterally.

The abdomen is about equal in length to the cephalothoracic region, slender and cylindrical, without teeth or spines; the fifth somite is about one-third longer than the preceding somite.

The third maxillipeds have no exopods; the basis is a little more than one-third of the total length. The first and second legs carry exopods. The remaining legs are slender and do not differ greatly in length. The proportions of the last pair are much as in the male.

The uropods have the peduncle about half as long as the last somite. The endopod is about three times as long as the peduncle, with a stout terminal spine of less than half its length and two spinules on the inner edge, which is finely serrated throughout. The exopod is less than one-eighth of the length of the endopod, with a slender terminal spine which reaches beyond the middle of the latter.

There is an irregular patch of dark pigment on each side of the anterior part of the carapace and a band encircling the penultimate somite of the abdomen.

Adult Male.—Total length 1·6 mm.

Carapace a little more than one-third of total length, not so deep as in the female, not much narrowed in front, its width greater than its depth. Seen from the side the dorsal edge is nearly straight, with a median depression between the inflated branchial regions; the pseudorostrum is very short and blunt; antero-lateral margin deeply concave, antero-lateral angle rounded and armed with a curved spine, behind which are a few irregular serrations. Seen from above, the lateral plates of the pseudorostrum meet for a short distance above the respiratory channel and the antero-lateral angles project laterally. The eyes are large and darkly pigmented, and the distance between them is not more than one-sixth of the length of the carapace. The surface of the carapace is very minutely granular.

The first leg-bearing somite is hardly visible and its pleural plates are very small.

The pleural plates of the succeeding somites are not so much expanded laterally as in the female.

The abdomen is about equal in length to the cephalothoracic region, without teeth or spines on the dorsal surface, but with a lateral groove overhung by a serrated crest on each of the somites; the fifth somite is at least one-half longer than the fourth.

The antennule has a rather slender peduncle, the first segment about as long as the other two together; the second segment is produced distally into a narrow process bearing a group of plumose setæ; the inner flagellum is unsegmented and equal in length to the first of the two segments of the outer.

The flagellum of the antenna extends, in the natural position, at least as far as the penultimate somite of the abdomen.

The mouth-parts closely resemble those of *N. unguiculatus,* but the palp of the maxillula is relatively a little longer. The third maxilliped has a well-developed exopod and the basis is about half of the total length.

The first legs have the basis little more than half the combined length of the remaining segments; there are no teeth on the outer margin of the ischium and merus.

The legs of the last pair are less than one-third of the length of the body; the basis is about one-fourth of the length of the limb, the carpus nearly four times as long as the merus and nearly one and a half times as long as the propodus; the dactylus with its claw is a little longer than the carpus.

The uropods have the peduncle about two-thirds as long as the last somite. The endopod is about three times as long as the peduncle, with a terminal spine of one-third of its length and five spinules on the distal part of the finely serrated inner edge. The exopod is about one-tenth of the length of the endopod and its terminal spine reaches beyond the middle of the latter.

As in the female, there are some irregular patches of pigment on the side of the carapace and a band encircling the penultimate somite and there are also less distinct and less constant bands on the third and fourth abdominal somites.

Remarks.—This species is closely allied to *N. suhmii* G. O. Sars ('Challenger' Rep. Cumacea (1887), p. 63, pl. x. figs. 4–5). As I have elsewhere mentioned (Herdman's Rep. Ceylon Pearl Fisheries, Royal Soc. pt. ii. (1904) p. 177), the type specimens of that species are now more accessible for examination than when they were described by Prof. Sars, although they are by no means in a good state of preservation. In the female specimen I find no trace of an exopod on the third maxilliped, and I believe that the species agrees with *N. zimmeri* in this character, Sars's mention of a small exopod on "the second pair of gnathopoda" being based on some misinterpretation of the mounted specimen. The female *N. suhmii*, however, differs from the species described above in the form of the carapace, which, as shown in Sars's figure, has the branchial regions very strongly inflated and the posterior part of the dorsal surface much more prominent;

there seems to have been a median spine or tooth a little in front of the middle of the dorsal surface; the anterior abdominal somites have strong paired teeth on the dorsal side; and the exopod of the uropods, with its spine, is not more than one-third of the length of the endopod. The males of the two species are much more alike, but in *N. suhmii* the exopod of the uropods is much shorter than in the species described above, being even shorter, relatively, than in the female (the proportion of one-fourth of the exopod, which I formerly mentioned for the males, is, however, slightly exceeded in some specimens).

Occurrence.—" Trincomali, Ceylon, surface, 3/1889, K. Fristedt Coll." Copenhagen Museum. Co-types in British Museum.

NANNASTACUS GIBBOSUS, sp. n. (Plate XXXIII. figs. 16–21.)

Description of adult Female.—Total length 1·8 mm.

Carapace two-fifths of total length, little broader than deep. The pseudorostrum is very short and truncate and the two parts meet together in the middle line below the respiratory orifice. The antero-lateral margin is deeply concave, the antero-lateral corner produced and triangular, sometimes with one or two teeth at the tip. The eyes are prominent and darkly pigmented. The surface of the carapace is very uneven, but the inequalities are developed in varying degrees in different specimens. The branchial regions are inflated to form rounded bosses, between which the dorsal surface is depressed in the middle line. Posteriorly, the dorsal surface is elevated more or less and there is a small boss on each side just behind the eyes. One or two spiniform teeth are commonly set on the posterior elevation of the dorsal surface and another in the middle a little way behind the eyes, but all of these may be absent. A number of long setæ are scattered over the surface of the carapace.

The first leg-bearing somite is represented only by the pleural plates. The remaining thoracic somites have the pleural plates expanded and rounded. The second and the last somites may have a spiniform tooth in the middle of the dorsal surface, as may also the first abdominal.

The abdomen is a little shorter than the cephalothoracic region, the fifth somite is about twice as long as deep and rather more than one-third longer than the preceding somite.

The antennule has the third segment of the peduncle longer than the second and, together with it, longer than the first; the outer flagellum has a minute terminal segment.

The third maxillipeds have no exopods; the basis is about one-third of the total length of the limb.

The first legs have well-developed exopods; the basis is about two-sevenths of the total length of the limb.

The second legs have well-developed exopods; the basis is inflated and is about three-fourths as long as the distal segments together; the distal segments are broad, the carpus is distinctly longer than the merus, and the dactylus is twice as long as the propodus.

The remaining legs do not differ greatly in length; the last pair are about one-third of the total length of the body. The basis is a little over one-fourth of the length of the limb, the carpus is a little more than twice as long as the merus and about equal to the propodus.

The uropods have the peduncle a little over three-fourths as long as the last somite, with two small teeth on the inner edge. The endopod is nearly three times as long as the peduncle, with a stout terminal spine of about one-third of its length and with five small spines on its inner edge. The exopod is less than one-eighth as long as the endopod, with a slender terminal spine which does not reach to the end of the latter.

Remarks.—The specimens described above resemble the female of Sars's *N. suhmii* even more closely than does that of *N. zimmeri*, especially in the inflated branchial regions and the posterior gibbosity of the carapace. They differ from *N. suhmii* in the shorter and more obtuse pseudorostrum, in the less prominent dorso-lateral teeth of the first abdominal somite and their absence from the following somites, in the shorter carpus of the posterior legs, and in the much longer exopod of the uropods.

Occurrence.—Gulf of Siam, "Koh Chang, about 1 fathom, coral," "Koh Kam, 5 fathoms, mud." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

NANNASTACUS REPTANS, sp. n. (Plate XXXIII. figs. 22–28.)

Description of adult Female.—Total length 1·5 mm.

Carapace more than one-third of total length, little broader than deep. The pseudorostrum is very short and truncate, and the two parts meet together in the middle line below the respiratory orifice. The antero-lateral margin is deeply concave, the antero-lateral corner produced and triangular. The eyes are prominent and darkly pigmented. The surface of the carapace is very uneven, being depressed in the middle line between the inflated branchial regions and with a median convexity anteriorly. A few long setæ are set on the branchial regions and on other parts of the surface.

The first leg-bearing somite appears to be represented only by the pleural plates. The remaining thoracic somites have the pleural plates expanded and rounded, without spines. The last thoracic and the first abdominal somites have each, on the dorsal surface, a pair of small spiniform teeth.

The abdomen is nearly equal to the cephalothoracic region; the fifth somite is a little less than twice as long as deep and about one-third longer than the preceding somite.

The antennule has the second and third segments of the peduncle subequal and together about equal to the first segment. The outer flagellum has a minute terminal segment.

The mandibles, maxillulæ, maxillæ, and first maxillipeds appear to differ in no conspicuous characters from those of *N. unguiculatus*. The second maxillipeds have the basis only about one and a half times as long as broad; the basal plate carries seven setæ.

The third maxillipeds have no exopods; the basis is less than one-third of the total length of the limb; the distal segments are relatively very stout.

The first legs also are without exopods. The basis is not more than one-quarter of the total length of the limb.

The second legs have no exopods. The basis is not inflated and is little shorter than the remaining segments together. The distal segments are broad, the carpus is hardly longer than the merus, and the broad dactylus is not twice as long as the propodus.

The remaining legs increase slightly in length to the last pair, which are about two-fifths of the total length of the body; the basis is a little over one-fourth of the length of the limb, the carpus is not three times (in the third pair it is less than twice) as long as the merus and a little shorter than the propodus.

The uropods have the peduncle about two-thirds as long as the last somite, with two small teeth on the inner edge. The endopod is about twice as long as the peduncle, with a stout terminal spine of about half its length and with three minute spines and a small seta on the inner edge. The exopod is less than one-fifth as long as the endopod, with a slender terminal spine which reaches nearly to the end of the latter.

Remarks.—This species differs from that last-described in the form of the carapace (which has the branchial regions less inflated and the anterior part of the dorsal surface more strongly arched), in the greater length of the posterior legs, and in the different proportions of the uropods. It differs more remarkably in the absence of exopods from the legs of the first and second pairs, in which respect it resembles the species described below as *N. tardus*.

Occurrence.—Gulf of Siam, "Koh Kahdat, about 1 fathom, coral, i.–ii./00," "Koh Chang, 1 fathom, coral, i.–iii./00." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

NANNASTACUS MINOR, sp. n. (Plate XXXIV. figs. 1–3.)

Description of adult Female.—Total length 1·3 mm.

Carapace not quite two-fifths of total length, little broader than deep. Pseudo-rostrum very short and truncate, the two parts meeting in the middle line below the respiratory orifice. Antero-lateral margin deeply concave, the antero-lateral corner produced and triangular. Eyes prominent and darkly pigmented. Surface of carapace not very uneven, the branchial regions only slightly inflated, with a depression between them in the mid-dorsal line. There are a few scattered setæ on the surface of the carapace.

The first leg-bearing somite is represented only by the pleural plates. The remaining thoracic somites have the pleural plates expanded and rounded.

The abdomen is shorter than the cephalothoracic region; the fifth abdominal somite is barely twice as long as deep, and less than one-third longer than the preceding somite.

The antennule has the third segment of the peduncle shorter than the second and, together with it, a little shorter than the first.

The third maxillipeds have no exopods; the basis is less than one-third of the total length of the limb; the distal segments, especially the carpus and propodus, are very stout and only slightly flattened.

The first legs have well-developed exopods; the basis is about two-sevenths of the total length of the limb; the distal segments, especially the carpus and propodus, are expanded and flattened.

The second legs have well-developed exopods; the basis is inflated and is about equal to the remaining segments together; the distal segments are broad, the carpus is distinctly longer than the merus, and the dactylus is only a little longer than the propodus.

The remaining legs do not differ greatly in length. The last pair are about two-fifths of the total length of the body; the basis is more than one-fourth of the length of the limb, the carpus is about twice as long as the merus and a little shorter than the propodus.

The uropods have the peduncle nearly two-thirds as long as the last somite. The endopod is about twice as long as the peduncle, with a stout terminal spine of more than half its length, and with three small spines on its inner edge. The exopod is about one-fifth as long as the endopod, with a slender terminal spine which reaches nearly to the end of the latter.

Remarks.—Apart from the possession of exopods on the first and second pairs of legs this species resembles the preceding somewhat closely, especially in the relative length and proportions of the posterior legs and of the uropods. There are, however, small but constant differences in the form of the carapace, which has the branchial regions less inflated and the dorsal surface less arched; in the stoutness of the distal segments of the third maxillipeds and first pair of legs; and some small differences of proportion noted in the description above. It has already been mentioned as a possibility that this species may represent only a variation or a phase of development of *N. reptans*, but I do not think that this is probable.

Occurrence.—Gulf of Siam, "Koh Kahdat, about 1 fathom, coral, 1/2/00," "Koh Chang, 1 fathom, coral, 1/3/00." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

NANNASTACUS TARDUS, sp. n. (Plate XXXIV. figs. 4–11.)

Description of adult Female.—Total length 1·6 mm.

Carapace about three-sevenths of total length, considerably broader than deep. The pseudorostrum is very short and truncate, and the two parts meet together in the middle line below (and apparently also above) the respiratory orifice. The antero-lateral margin is deeply concave, the antero-lateral corner produced and triangular, extending in front of the pseudorostrum, the lower edge serrated anteriorly. The surface of the carapace is not very uneven and the branchial regions are only slightly inflated.

The first leg-bearing somite is represented only by the pleural plates, which, like those of the following somites, are greatly expanded laterally and bear a marginal row of laminar spines (partially detached in the specimen figured). The second leg-bearing somite has a small median tooth dorsally.

The abdomen is shorter than the cephalothoracic region: the first somite has a pair of small dorso-lateral teeth, but these are often absent, or perhaps readily become detached; the fifth somite is at least twice as long as deep and nearly one-half longer than the preceding somite.

The antennule has the second and third segments of the peduncle subequal and together about equal to the much stouter first segment.

The third maxillipeds have no exopods. The basis is less than one-third of the total length of the limb, and its distal process is very long and narrow.

The first legs also have no exopods. The basis is about two-sevenths of the total length of the limb, and has a prominent rounded lobe on its inner edge.

The second legs are without exopods. The basis is about three-fourths as long as the remaining segments together. The carpus is much longer than the merus and the dactylus is not twice as long as the propodus.

The remaining legs are subequal in length and less than one-third as long as the body. The basis is about one-fourth of the length of the limb, the carpus is less than three times as long as the merus and about equal to the propodus.

The uropods have the peduncle little more than half as long as the last somite. The endopod is a little more than twice as long as the peduncle, with a stout terminal spine of less than half its length and three small spines on the distal part of its inner edge. The exopod is about one-sixth as long as the endopod, and its terminal spine does not reach to the end of the latter.

Remarks.—In the form of the carapace, with its strongly produced antero-lateral angles and slightly inflated branchial regions, this species approaches more closely to *N. unguiculatus* than to any other species hitherto described. It differs from that species, however, in having no exopod on the third maxilliped, in the absence of spines from the carapace and from the dorsal surface of the posterior abdominal somites, the much feebler serrations on the lower margin of the carapace, the shorter posterior legs and exopod of the uropods, and in many other details. It also differs from all other Cumacea, with the exception of *N. reptans* described above, in having no exopods on the first and second pairs of legs.

Occurrence.—Gulf of Siam, "Koh Kam, 5–10 fathoms, 2/00," "Koh Kahdat, 4–5 fathoms, 16/2/00," "Between Koh Mesan and Cape Liant, 5–8 fathoms, 8/2/00," "North of Koh Mesan, 10–15 fathoms, 15/2/00." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

NANNASTACUS AGNATUS, sp. n. (Plate XXXIV. figs. 12 & 13.)

Description of adult Female.—Total length 1·3 mm.

Resembling the specimens of *N. tardus* very closely, but having well-developed exopods on the legs of the first and second pairs. The basis of the first legs is a little shorter, but is shaped as in that species; the basis of the second legs is a little longer; the posterior legs appear to be slightly stouter and shorter. The last somite is distinctly shorter and the peduncle of the uropods is more than half its length.

Remarks.—Apart from the presence of exopods on the first two pairs of legs, I have not been successful in finding any characters other than those mentioned above to differentiate this species from *N. tardus.* The possibility suggests itself, therefore, even more strongly than in the analogous case of *N. reptans* and *N. minor*, that we have to do here with a single species in which the exopods may be lost (1) by accident, (2) as a matter of individual variation, or (3) normally in the course of the breeding-period. The analogy of other Cumacea makes the first of these very improbable; as regards the third it is to be noted that both forms are represented by ovigerous females, and that the specimens of *N. tardus* are on the whole, a little longer than those of *N. agnatus.* I do not think that any importance can be attached to the fact that, except in one case, the two forms occurred together in the same gatherings, and in the absence of conclusive evidence that they belong to a single species, it seems convenient to assign specific names to both.

Occurrence.—Gulf of Siam, "Koh Kam, 5-10 fathoms, 2/00," "Koh Kahdat, 4–5 fathoms, 16/2/00," "Between Koh Mesan and Cape Liant, 5–8 fathoms, 8/2/00," "North of Koh Mesan, 10–15 fathoms, 2/00." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

SCHIZOTREMA, gen. nov.

Carapace more or less depressed, not overhanging the anterior free somites; lateral plates of pseudorostrum not meeting in front of head, exhalent respiratory orifices paired and widely separated from each other; third maxillipeds and first two pairs of legs with exopods in female: other characters as in *Nannastacus.*

Type-species *S. depressum*, sp. n.

This genus bears the same relation to *Nannastacus* that *Zygosiphon* bears to *Cyclaspis*. No males have yet been identified, but the analogy of *Zygosiphon* makes it probable that the division of the respiratory openings will be found in that sex also. In the type-species the second maxilliped has a distinct ischium, but for reasons already mentioned (p. 351) I prefer not to regard this character as of generic value.

Key to the Species of Schizotrema.

A. Carapace very broad and depressed; a conspicuous lateral series of spines on carapace, posterior thoracic somites, and abdomen; peduncle of uropod longer than last somite . . . . *S. depressum*, sp. n.

B. Carapace less depressed; no conspicuous lateral spines on carapace or abdomen; peduncle of uropod not more than half as long as last somite.
  a. Surface of body with numerous small spines and tubercles; antero-lateral angle of carapace produced as a stout cylindrical process . . *S. bifrons*, sp. n.
  b. Surface of body for the most part smooth; antero-lateral angle produced as a slender tooth . . . . *S. sordidum*, sp. n.

Schizotrema depressum, sp. n. (Plate XXXIV. figs. 14–17.)

Description of adult Female.—Total length 1·5 mm.

Carapace a little less than one-third of total length, very broad and depressed. The pseudorostrum, seen from the side, is very short and truncate, directed obliquely upwards. Seen from above, the two parts of the pseudorostrum are widely separated, each completely surrounding the respiratory orifice, from which a long branchial siphon is protruded. The antennal notch is obsolete, the antero-lateral margin descending nearly vertically to the rounded antero-lateral corner, which carries a stout curved spine. A series of spines runs backwards from this along the lateral edge of the carapace, diminishing in size until the last two or three, which are again larger. The darkly-pigmented eyes lie just behind the branchial openings; the number of corneal facets could not be determined. The surface of the carapace is everywhere minutely granular, and, in some specimens, there is found on each of the branchial regions and on an elevation of the dorso-lateral surface on each side behind the eye a large granule or vesicular outgrowth, which apparently is very easily detached.

The free thoracic somites are very broad and depressed, their pleural plates armed with large spines.

The abdomen is shorter than the cephalothoracic region. The somites, with exception of the first, have a series of stout spines on each side; the last somite is shorter than the penultimate and is rounded posteriorly.

Long setæ are set here and there over the surface of the body, and a very conspicuous row of them fringes the lateral margins of carapace, free thoracic somites, and abdomen.

These lateral setæ are always thickly encrusted with mud, and as they project horizontally they greatly increase the apparent breadth and flatness of the body.

The antennule resembles closely that of *Nannastacus unguiculatus*, but the third segment of the peduncle is longer than the second, and only two segments could be detected in the outer flagellum. The antenna has the conical tip more produced than in the species named, and the basal part has two teeth on its anterior margin.

The mouth-parts resemble those of *N. unguiculatus*, except in trivial details. The third maxillipeds have a well-developed exopod, and have the carpus and propodus somewhat broadened.

The first legs are relatively longer than in *N. unguiculatus*. The basis is about two-fifths as long as the distal segments together. No teeth could be detected on the outer edge of the basis, ischium, or merus. In the second legs the distal segments are a little stouter than in the species named, and there are no conspicuous teeth on the outer edge of the basis.

The last three pairs of legs are much stouter and shorter than in *N. unguiculatus*. In the third pair the basis is about two-thirds as long as the distal segments together, the carpus is hardly longer than the merus and shorter than the propodus. In the fifth pair the basis is more than half as long as the distal segments together; the carpus is about one-half longer than the merus and about equal to the propodus; the dactylus, with its claw, is about equal to the propodus.

The uropods have the peduncle a little longer than the last somite, slightly expanded distally, with three conspicuous teeth on the inner edge. The endopod is a little longer than the peduncle, with a strong terminal spine a little longer than the ramus itself and a shorter spine near the distal end of the inner edge. The exopod is more than three-fourths as long as the endopod, with a long and slender terminal spine.

Occurrence.—Gulf of Siam, "Koh Kahdat, about 1 fathom, coral." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

SCHIZOTREMA BIFRONS, sp. n. (Plate XXXIV. figs. 18–21.)

Description of adult Female.—Total length 1·65 mm.

The carapace is a little less than two-fifths of the total length, its height not more than two-thirds of its greatest width. The pseudorostrum, seen from the side, is very short and rounded, with a group of curved spines on its lower edge; seen from above, the two parts of the pseudorostrum surrounding the respiratory orifices are widely separated; the branchial siphons are long. The antero-lateral margin slopes backwards from the lower edge of the pseudorostrum, and a widely open and angular antennal notch is completed below by the antero-lateral angle, which is produced as a stout cylindrical process tipped with a curved spine; a row of small spines on the outer surface of this process runs backwards on to the side of the carapace. The darkly pigmented eyes, each with three corneal facets, lie just behind the respiratory orifices. The surface of the carapace bears irregularly scattered small spines or tubercles interspersed with short hairs.

The first leg-bearing somite is almost entirely concealed; the remaining thoracic somites are broad and depressed, with a few small tubercles on the dorsal surface and on the pleural plates.

The abdomen is a little shorter than the cephalothoracic region. The somites are short and stout, the penultimate not longer than the preceding and shorter than the last somite, which is acutely pointed in the middle line posteriorly; they bear a few tubercles and short hairs.

The antennules have a rather stout peduncle, with two spines at the distal end of the first segment.

The third maxilliped has a well-developed exopod.

The posterior legs are rather long and slender. In the fifth pair the basis is about two-fifths as long as the distal segments together, the carpus is nearly three times as long as the merus and a little longer than the propodus; the dactylus, together with its strongly curved claw, is about three-fourths as long as the propodus.

The peduncle of the uropods is about half as long as the last somite and not much longer than broad, irregularly toothed on the outer and inner edges. The endopod is about two and a half times as long as the peduncle, strongly serrated on both edges, with a stout terminal spine of nearly half its length, and a small spine close to it at the distal end of the inner edge. The exopod is a little less than half as long as the endopod, and its slender terminal spine reaches beyond the end of the latter.

Occurrence.—"Paumben, India, 1–5 fathoms, K. Fristedt Coll." Copenhagen Museum.

Schizotrema sordidum, sp. n. (Plate XXXIV. figs. 22–24.)

Description of adult Female.—Total length 1 mm.

Carapace nearly two-fifths of total length, rather broad and depressed. The pseudorostrum, seen from the side, is short and truncate, directed obliquely upwards; seen from above the two parts of the pseudorostrum surrounding the respiratory orifices are completely separated; the branchial siphons are long. The antennal notch is obsolete, the antero-lateral corner is produced into a slender point bearing a transparent apical spine. The darkly-pigmented eyes lie just behind the branchial openings; the number of corneal facets could not be determined. The surface of the carapace is sparsely covered with long hairs, but no spines were observed.

The free thoracic somites are broad and depressed, their pleural plates carrying long hairs and a few transparent and inconspicuous spines.

The abdominal somites are beset with long hairs, but these do not form a distinct lateral fringe as in *S. depressum*. The last somite is a little shorter than the penultimate and is rounded posteriorly.

The antennule has the third segment of the peduncle slightly longer than the second; the outer flagellum has three segments, the terminal one minute.

The third maxilliped has a well-developed exopod.

The first legs have the basis about one-third as long as the distal segments together, without teeth on the proximal segments. The last three pairs of legs are very long and slender. In the last pair the basis is little more than two-fifths as long as the distal segments together, the carpus is nearly four times as long as the merus and one-third longer than the propodus; the slender curved dactylus, with its claw, is about two-thirds as long as the propodus.

The peduncle of the uropods is not more than half as long as the last somite, without distinct teeth on the inner edge. The endopod is more than three times as long as the peduncle, serrated with very transparent teeth on its inner edge, and with a slender terminal spine. The exopod is about half as long as the endopod.

Remarks.—The incrustation of mud which commonly covers the body and limbs in species of this genus rendered the examination of this very minute form tedious and difficult. In removing the mud it is possible that some spines on the surface of the carapace may have been detached and overlooked, and it is probable that the number of hairs on the body and limbs was greatly diminished.

Occurrence.—Gulf of Siam, "Koh Chang, about 1 fathom, coral," "Koh Kahdat, 1 fathom, coral." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

CAMPYLASPIS PLATYUROPUS, sp. n. (Plate XXXIV. figs. 25–29.)

Description of immature Female (with developing brood-pouch).—Total length 1·8 mm.

The carapace is a little more than one-half of the total length and its dorsal surface is strongly arched. On each side is an oblique dorso-lateral ridge which curves towards the middle line on the posterior part of the dorsal surface. The pseudo-rostrum is short and truncated and the antennal notch is obsolete. The ocular lobe is very small and the eye is not distinct.

The abdominal somites are stout and are slightly depressed.

The mouth-parts have the structure usual in the genus.

The third maxillipeds have a well-developed exopod; the basis is shorter than the distal segments together; the merus is greatly expanded, less than twice as long as broad, and longer than the last three segments together.

The first legs have the basis about as long as the distal segments together; the ischium is produced internally into a large but thin and transparent triangular tooth.

The second legs have the terminal segment rather stout and shorter than the two preceding together.

The uropods are remarkably broad and flattened. The peduncle is less than twice as long as the last somite and two and a half times as long as broad, while its vertical thickness is little more than half its width. The endopod is about three-quarters as long as the peduncle, and its width near the base is about one-third of its length; it has seven spines on the inner edge, a longer terminal spine, and a small spinule external to the latter. The exopod is distinctly shorter than the endopod, with two slender terminal spines and one spinule each on the inner and outer edges.

Young Specimen.—In a very young specimen only ·9 mm. long, which I suppose to belong to this species, the flattening of the uropods is still more marked, the peduncle being little longer than broad, while the endopod is only about twice as long as broad.

Remarks.—In spite of its small size, the larger of the two specimens described above appears to be approaching maturity, and we may therefore assume that the broadened form of the uropods, though less marked than in the young, does not disappear in the adult.

Occurrence.—Gulf of Siam, "Koh Kam, 10 fathoms, 4/2/00," "Between Koh Mesan and Cape Liant, 5–8 fathoms, 7/2/00." Th. Mortensen Coll., Copenhagen Museum.

Campylaspis orientalis, sp. n. (Plate XXXV. figs. 1–5.)

Description of adult Female.—Total length 5·5 mm.

Closely resembling *C. rubicunda* Lilljeborg, as described by Sars. The pseudo-rostrum is very short and truncated as seen from above. The ocular lobe is longer than broad and the eye is indistinct. The abdominal somites are not depressed and are without lateral carinæ. The terminal segment of the first maxillipeds is larger than in Sars's figures. Third maxillipeds differing considerably from those of *C. rubicunda*; basis much longer than the distal segments together; ischium slightly produced internally; merus not greatly expanded, not wider than ischium, its inner edge straight or slightly concave, not nearly equal to the two succeeding segments together; propodus much longer than carpus. None of the segments are conspicuously serrated on the margins. First legs with the merus not expanded, hardly longer than the carpus. Second legs with the terminal segment shorter than the two preceding segments together, stouter than in *C. rubicunda*, with a long terminal seta. Uropods with peduncle about twice as long as last somite, not serrated internally; endopod about half as long as peduncle, with about eight spines on inner edge, terminal spine stouter than in *C. rubicunda.*

The specimens retain traces of a reddish-purple colour.

Remarks.—The resemblance of the specimens described above to *C. rubicunda* is so close that I should have been inclined to identify them with that species had it not been for the difference in shape of the third maxillipeds.

Occurrence.—"Korea, 35 fathoms, 22/1/82, Suenson Coll." Copenhagen Museum.

Family DIASTYLIDÆ.

Dr. C. Zimmer has lately (Cumaceen der Deutschen Tiefsee-Exp. p. 181, 1908) discussed in detail the classification of this extensive family. His re-definition of the genus *Diastylopsis* makes possible a more satisfactory allocation of a number of species previously referred to *Leptostylis*, but there are indications that the grouping of the species can be regarded only as provisional. Thus the general form of the body and the disposition of the posterior thoracic somites, which Zimmer regards as the chief distinguishing features of *Diastylopsis*, are repeated in some of the species of the new genus *Gynodiastylis* described below, and that genus is linked, by the important character of the third maxilliped, to the otherwise widely different *Paradiastylis*. Again, *Leptostylis thileniusi* Zimmer is now referred by its describer to *Diastylopsis*; but it has a very remarkable structure of the third maxilliped not found in the other species of the latter genus, and this structure, as I have pointed out (Ann. Mag. Nat. Hist. (8) i. p. 239, 1908), is clearly derived from the simpler condition found in *Leptostylis insularum*, a species which, according to Dr. Zimmer's classification, would fall into the genus *Diastylis*. On the other hand, the genus *Leptostylis*, reduced within the limits of a relatively precise definition by Zimmer's removal of various species to other genera, must again overrun these limits to include *L. walkeri* (Calman, Bull. Mus. d'Hist. Nat. Paris, 1907, no. 2, p. 121), which, by its well-armed telson, infringes the leading character of the definition.

Of *Diastylis*, which still includes the majority of the species of the family, Dr. Zimmer finds it impossible to give a satisfactory diagnosis—"Man kann einfach sagen, dass *Diastylis* diejenigen Diastylidenarten umfasst, die in keine der anderen Gattungen passen." As a matter of fact, the species included in *Diastylis* differ among themselves in characters which, in some cases, seem as important as those distinguishing the other genera, although without the discontinuity which renders easy the definition of generic groups.

The limits of the family itself tend to become indistinct. Thus, as Dr. Zimmer remarks, it is, with our present knowledge, very much a matter of taste whether *Pseudodiastylis* is to be referred to the Diastylidæ or to the Lampropidæ, and the new genus *Colurostylis* has the form of telson characteristic of the Pseudocumidæ, while the characters excluding it from that family are neither numerous nor very weighty.

Key to Genera of Diastylidæ.

A. No pleopods present in male sex. (Third maxilliped without exopod in female.) . . . . GYNODIASTYLIS, g. n.

B. Two pairs of pleopods in male sex.

a. Third maxilliped without exopod in female . . . . PARADIASTYLIS Calman.

b. Third maxilliped with exopod in both sexes.
  A. Telson without spines.
    a. Telson very small, flattened; endopod of uropods of two segments; third and fourth legs with vestigial exopods in female . . . . COLUROSTYLIS, g. n.
    b. Telson larger, cylindrical; endopod of uropods of three segments; third and fourth legs without exopods in female . . . . PACHYSTYLIS Hansen *.
  B. Telson with at least a pair of apical spines.
    a. Body of mandible abbreviated . . . . DIASTYLOIDES G. O. Sars.
    b. Body of mandible normal.
      a′. Pleural plates of third and fourth free thoracic somites expanded backwards; third legs widely separated from second in adult female . . . . DIASTYLOPSIS S. I. Smith.
      b′. Pleural plates of thoracic somites not produced backwards; third legs close to second in adult female . . { DIASTYLIS Say. / LEPTOSTYLIS G. O. Sars.
  C. Telson with a median apical spine . . . . PSEUDODIASTYLIS Calman.

Genus GYNODIASTYLIS, gen. nov.

Pleural plates of third and fourth free thoracic somites more or less expanded backwards, third legs separated from second in adult female; telson unarmed, tubular, not produced beyond anus; third maxillipeds without exopods in female; no pleopods in male; endopod of uropods unsegmented or of two segments.

Type-species *G. carinata*, sp. n.

The name of this genus is intended to allude to the fact that the males resemble the females more closely than in the other genera of the family. In the type-species and in *G. lævis* the absence of exopods from the third and fourth pairs of legs makes it difficult to distinguish between males and immature females †. According to the precedents of Cumacean taxonomy, the presence of well-developed exopods on these legs in males of *G. costata* and *G. bicristata* would be regarded as a distinction of generic value, but in view of the close general resemblance between *G. carinata* and *G. costata* it seems impossible, for the present, to place them in separate genera.

Key to the Species of Gynodiastylis.

A. No exopods on third and fourth legs of male.
  a. Carapace with six longitudinal ridges on each side. Endopod of uropods of two segments . . . . *G. carinata,* sp. n.
  b. Carapace smooth. Endopod of uropods unsegmented . . . . . . *G. lævis,* sp. n.

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* See also the remarks on *Diastylis* (?) *fistularis*, sp. n., below.

† The only other Cumacean of which the males resemble the females in the number of the thoracic exopods and in having no pleopods is *Heteroleucon akaroënsis* (Trans. Zool. Soc. xviii. (1) p. 34, 1907).

B. Exopods present on third and fourth legs of male.
a. Carapace with numerous longitudinal ridges . . . . *G. costata*, sp. n.
b. Carapace with a pair of dorso-lateral ridges . . . . *G. bicristata*, sp. n.

GYNODIASTYLIS CARINATA, sp. n. (Plate XXXV. figs. 6–31.)

Description of adult Female.—Total length 4·0 mm.

Carapace a little less than one-third of total length, its vertical height a little more than one-half of its length, subcylindrical, narrowed in front; dorsal outline very slightly arched as seen from the side. Pseudorostrum straight, horizontal, acutely pointed, a little less than one-fourth of length of carapace. Antennal notch widely open, defined below by the slightly-produced antero-lateral tooth. The surface of the carapace bears six longitudinal ridges on each side. Starting from the hind margin near the middle line, a ridge, somewhat less strongly marked than the others, runs forwards and inwards to meet its fellow at about the middle of the length of the carapace; from nearly the same point on the hind margin the second ridge runs directly forwards as far as the ocular lobe; the third ridge, nearly parallel with the last, curves slightly inwards anteriorly and ends close to the fronto-lateral fissure; the fourth ridge curves upwards a little in front of its origin, bounding a shallow depression on the side of the carapace, and then runs forwards on to the base of the pseudorostrum; the fifth ridge, which is very strong, runs below the above-mentioned depression and ends on the antero-lateral angle; a faintly-marked sixth ridge is visible in some specimens just above the lower margin of the carapace. The ocular lobe is less than twice as broad as long and bears three large but indistinctly defined corneal facets; the eye is without pigment.

All the five leg-bearing somites are distinct. The pleural plates of the third somite are expanded and produced in front and behind and the corresponding appendages are articulated near the posterior end, so that, in the adult female, a wide interval is left between the second and third pairs of legs. In this somite also, and to a greater degree in the two succeeding somites, the attachment of the limb is rotated backwards and upwards, so that, in the last somite, the leg is attached to its posterior border, and, when extended, points directly backwards. The last two somites have each a pair of longitudinal ridges on the dorsal surface.

The abdomen is distinctly shorter than the cephalothoracic region; the somites are slightly depressed, with a lateral longitudinal ridge on each side; as is usual in the Diastylidæ, the hinder edge of each somite is strongly concave on the upper surface. The penultimate somite is little longer than the preceding. The last somite is flattened from above downwards and is about as broad as long.

The telson is two-thirds as long as the last somite. Seen from above it is ovate in outline, its breadth three-fourths of its length, truncated in front and bluntly pointed at the tip, which bears two extremely minute setiform points. From the side it is seen to be tubular anteriorly, but cut away below from about the middle of its length to receive the obliquely placed anal valves. The apex of the telson does not project beyond the upper ends of the valves.

The antennules have the first segment of the peduncle longer than the other two together, and the second about half the length of the third; the outer flagellum is composed of two segments, of which the first is the longer; the inner flagellum is composed of three segments and is about equal in length to the first segment of the outer.

The antennæ are short, of three segments, with possibly a very minute terminal segment; each segment carries a plumose seta.

The mandibles are of the usual shape, with an elongated body and a row of twelve spines.

The other mouth-parts are of normal type. The maxillular palp is short and carries two setæ.

The first maxilliped has three very long setæ springing from the last three segments. The branchial apparatus is quite devoid of lobules, with the possible exception of a vestigial one near the proximal end.

The second maxilliped has a very long seta springing from the penultimate segment; the basal plate has eight setæ.

The third maxilliped has no exopod; the basis is slightly expanded but not produced distally, where it bears a series of long plumose setæ; the distal segments are rather slender, the propodus a little longer than either the carpus or the dactylus.

The first legs are stout and do not extend much in front of the pseudorostrum; the basis is about three-fourths as long as the distal segments together; the carpus is nearly twice as long as the two preceding segments together and has the inner edge irregularly tuberculate; the propodus is less than half as long as the carpus; the distal half of its inner edge is oblique and bears a series of ten very long smooth setæ, each slightly expanded at the base and four times as long as the segment from which they spring; the dactylus is little more than half as long and one-fourth as broad as the propodus, and bears one very long and some short setæ at the tip.

The second legs have the basis little more than twice as long as broad and as long as the remaining segments together; the distal segments become successively more slender; the dactylus is about as long as the propodus; the ischium is distinct, but very short.

The remaining legs are stout; the merus is slightly inflated, twice to three times as long as the carpus; the dactylus is slender, as long as the propodus, and its terminal spine is straight and very short.

The uropods have the peduncle a little shorter than the last somite and about two-thirds longer than the telson, slightly thickened distally, where the diameter is about one-third of the length. The exopod is about five-sixths as long as the peduncle; it bears two unequal stout setæ at the tip and two or three, more slender, on the inner edge, while the outer edge is clothed with very fine setæ. The endopod is about four-fifths as long as the exopod and is composed of two segments, the distal less than one-half as long as the proximal; it has a long terminal spine and four spines, each with a secondary seta, on the inner edge.

In the immature female there is no marked interval between the second and third pairs of legs.

Adult Male.—Total length 2·85 mm.

In general form the male resembles an immature female so closely as to be readily mistaken for one. It differs in having the ridges on the carapace somewhat more marked and especially in having strong paired dorso-lateral ridges on all the free thoracic somites instead of only on the last two. The pseudorostrum is narrowly truncated at the tip. The antero-lateral angle is rounded and obscurely serrated, and projects laterally so as to be visible from above.

The antennules have the outer flagellum composed of three segments.

The antennæ are very short, wholly concealed, in the natural position, by the carapace; the flagellum is composed of only eight segments and hardly exceeds in length the last segment of the peduncle, but its segments are well-defined and bear long sensory filaments.

The third maxilliped has an exopod which, in the adult male, is well-formed and carries long setæ, but in immature specimens is imperfectly segmented and has only rudimentary setæ at the tip.

The first legs are shorter than in the adult female, especially as regards the carpus, which is much less than twice as long as the two preceding segments together.

The third pair of legs have the basis stouter than in the female, expanding inwards just above the base so as to form a projecting shoulder. The setæ on the distal segments of this and the succeeding pairs of legs are stouter than in the female.

The uropods differ from those of the female in the fact that the rami are nearly equal in length and that the endopod has its proximal segment but little longer than the distal; the inner edge of the endopod has five spines including the subterminal one.

Remarks.—In addition to the characters which have been mentioned in the generic definition and in the key to the species, attention may be called to the peculiar tuft of long setæ on the propodus of the first legs and to the reduction of the antennal flagellum in the male.

Occurrence.—"Lyttleton Harbour, 1–5 fathoms, 8/97, H. Suter Coll." Copenhagen Museum. Co-types in British Museum.

GYNODIASTYLIS LÆVIS, sp. n. (Plate XXXV. figs. 32–39.)

Description of adult Female.—Total length 4·1 mm.

Carapace a little more than one-fourth of total length, its vertical height less than half of its length, subcylindrical, narrowed in front; dorsal outline slightly arched as seen from the side. Pseudorostrum straight, slightly deflexed, truncate, not more than one-eighth of total length of carapace. Antennal notch slightly marked, defined by a very small antero-lateral tooth. The surface of the carapace is quite smooth. The ocular lobe is slightly prominent as seen from the side; it is devoid of pigment and presents no distinct facets.

The first free thoracic somite is very short. The second is very long, more than a third of the length of the carapace as measured along the dorsal edge, and its pleural plate is produced anteriorly as a narrow lobe. The third and fourth somites are together little longer than the second in the dorsal line; their pleural plates are produced backwards and the articulation of the posterior legs is as in *G. carinata*.

The abdomen is slightly shorter than the cephalothoracic region. The somites are somewhat depressed and have faint lateral keels. The last somite is little shorter than the penultimate, about one-third longer than broad, and more than twice as broad as deep.

The telson is little more than half as long as the last somite, its breadth less than two-thirds of its length.

The antennules are shorter and more robust than in *G. carinata*. The first segment of the peduncle is less than twice as long as broad and about equal to the other two together, and the second is two-thirds as long as the third; the flagella are short and each composed of three segments. The antennæ resemble those of *G. carinata*.

The mouth-parts resemble those of *G. carinata*, but the distal setæ of the first and second maxillipeds are shorter than in that species. The third maxilliped is without an exopod; its basis is longer than in *G. carinata* and less expanded distally, where it carries only two or three setæ.

The first legs have the basis nearly twice as long as the distal segments together, produced distally at the inner corner as a strong tooth; the carpus is about as long as the two preceding segments together; the propodus is half as long as the carpus and bears three long setæ on the distal part of its inner edge; the dactylus is two-thirds as long as the propodus.

The second legs have the basis three times as long as broad and nearly twice as long as the remaining segments together; the dactylus and propodus are subequal and together shorter than the carpus.

The remaining legs are stout. The merus in the fifth pair is more than twice as long as the carpus; the dactylus is shorter than the propodus and its terminal spine is short and claw-like.

The uropods have the peduncle two-thirds as long as the last somite and reaching to two-thirds of the length of the telson, its distal diameter about one-third of its length. The exopod is about as long as the peduncle; it has two unequal stout setæ at the tip and a single small seta on the inner and two on the outer edge. The endopod is a little longer than the exopod and is unsegmented; it has a long terminal spine and six spines on the inner edge, the distal one much longer than the others; there are two or three setæ on the outer edge.

Adult (?) *Male.*—Total length 2·4 mm.

The male differs from the adult female in having a much shorter distance between the second and third pairs of legs, although the interval is more marked than in the male of *G. carinata.*

The carapace is shaped as in the female, with the pseudorostrum a little shorter and broader, and with the antero-lateral angle rounded. The ocular lobe is a little less prominent on the dorsal surface. The second leg-bearing somite is little longer than the first and its pleural plate is produced forwards as a narrow lobe. The pleural plate of the third somite is produced as a much broader lobe anteriorly.

The last abdominal somite is but little longer than broad and less than half as long again as the telson. The antennules have four segments in the outer flagellum. As in the male of *G. carinata*, the third maxilliped has a well-formed exopod. The difference in length of the rami of the uropods is a little more marked than in the female and the endopod has only four spines on the inner edge.

Remarks.—The difference in size between the sexes, much greater than in the case of *G. carinata*, throws doubt on the maturity of the male specimens described. In the characters of the antenna, however, they seem to be adult, the peduncle having a thick brush of setæ anteriorly, and the short flagellum (which was unfortunately broken in the specimen dissected) being distinctly segmented.

This species, while agreeing with *G. carinata* in having no exopods on the third and fourth legs of the male, differs from it in many important characters. Most conspicuous among these is the great size of the second free thoracic somite in the female. The first leg also differs greatly in the elongation of the basis and the feeble development of setæ on the propodus. Finally, the unsegmented endopodite of the uropods distinguishes the species from all the other members of the genus.

Occurrence.—"Lyttleton Harbour, 1–5 fathoms, 8/97, H. Suter Coll." Copenhagen Museum. Co-types in British Museum.

GYNODIASTYLIS COSTATA, sp. n. (Plate XXXVI. figs. 1–10.)

Description of adult Female.—Total length 2·35 mm.

Carapace about one-third of total length, its vertical height a little more than half its length; dorsal outline very slightly arched as seen from the side. Pseudorostrum straight, horizontal, acutely pointed, a little less than one-fourth of total length of carapace. Antennal notch widely open, defined below by the slightly produced antero-lateral tooth. The surface of the carapace is longitudinally ribbed, much as in *G. carinata*, but the ridges are more numerous and some of them are ill-defined and interrupted, so that it is difficult to make sure of their exact number and arrangement. There is a shallow depression towards the front on each side of the carapace, and in front of this, just behind the antero-lateral corner, is a short vertical ridge, forming a small tubercle behind the antennal notch, and continued upwards on to the side of the pseudorostrum. When viewed from above, this ridge is seen to carry a series of thin and transparent curved spines. The ocular lobe is about twice as broad as long. The eye is without pigment.

The pleural plates of the third free thoracic somite are produced in front and behind, and the attachment of the posterior legs is as in *G. carinata*. The penultimate thoracic somite has a pair of slightly marked dorso-lateral ridges.

The abdomen is shorter than the cephalothoracic region. The penultimate somite is little longer than the preceding. The last somite is flattened from above downwards and a little broader than long.

The telson is about three-fourths as long as the last somite. Seen from above its breadth is three-fourths of its length, and it is bluntly pointed at the tip, which bears two extremely minute setæ or spinules.

The antennules have the first segment of the peduncle as long as the other two together and the second half the length of the third; the outer flagellum is composed of two subequal segments; the inner flagellum has three segments and is shorter than the first segment of the outer.

The antennæ are short, of four segments, the terminal one very minute; each segment carries a plumose seta.

The first and second maxillipeds have long setæ springing from the distal segments as in *G. carinata*.

The third maxilliped has no exopod; the basis is slightly expanded, but not produced distally, where it bears a series of long plumose setæ; the distal segments are slender, the carpus, propodus, and dactylus subequal.

The first legs are stout and extend well beyond the pseudorostrum; the basis is about one-half as long as the distal segments together; the carpus is a little less than twice as long as the two preceding segments together; the propodus is half as long as the carpus, and the distal third of its inner edge is oblique and bears a series of about eleven smooth setæ, about two and a half times as long as the segment from which they spring; the dactylus is a little more than half the length of the propodus and bears one very long and some short setæ at the tip.

The second legs have the basis about two and a half times as long as broad and as long as the remaining segments together; the ischium is so short as to be easily overlooked; the distal segments become successively more slender; the dactylus is as long as the propodus and bears a small claw-like spine and one or two setæ at the tip.

The remaining legs are subequal in length, and stout. The merus is slightly inflated and about twice as long as the carpus; the propodus is half as long as the carpus and about equal to the dactylus, which is slender, curved, and terminates in a curved claw-like spine.

The uropods have the peduncle longer than the last somite and more than one and a half times as long as the telson, slightly thickened distally where the diameter is about one-third of the length. The exopod is nearly as long as the peduncle. It bears two unequal setæ at the tip and one or two small setules on the outer and inner edges. The endopod is a little longer than the exopod. It is composed of two segments, the distal a little longer than the proximal; it has two unequal spines at the tip and one spine on each segment on the inner edge.

Adult Male.—Total length 1·9 mm.

The carapace is more than one-third of the total length and has the dorsal outline more arched than in the female. The pseudorostrum is shorter and truncated. The antero-lateral serrations could not be demonstrated. The pleural plates of the third leg-bearing somite are not expanded, and there is no marked interval between the second and third pairs of legs.

There are four segments in the outer flagellum of the antennules. The antennæ are very short, only reaching, in the natural position, to the posterior edge of the carapace. There are well-developed exopods on the third maxillipeds and on all except the last pair of legs.

The peduncle of the uropods is about twice as long as the telson, and has four spinules on the inner edge. The rami are nearly equal in length and their terminal spines are long and slender. The endopod has, on the inner edge, two spines on the first and three on the second segment.

Remarks.—Apart from the presence of exopods on the third and fourth pairs of legs in the male, this species is distinguished from *G. carinata*, which it resembles in general characters, by the more numerous ridges on the carapace, by the curved claws of the posterior legs, and by other small characters mentioned above.

Occurrence.—Gulf of Siam, "Koh Kam, 20 fathoms, 4/2/00," "N. of Koh Chuen, 15 fathoms, 5/2/00," "Between Koh Mesan and Cape Liant, 5–8 fathoms, 7/2/00." Th. Mortensen Coll., Copenhagen Museum. Co-types in British Museum.

GYNODIASTYLIS BICRISTATA, sp. n. (Plate XXXVI. figs. 11–22.)

Description of adult Female.—Total length 1·9 mm.

Carapace a little less than two-fifths of total length, its vertical height about two-thirds of its length, inflated; dorsal outline, as seen from the side, strongly arched posteriorly, sloping in front. Pseudorostrum short, horizontal, acutely pointed as seen from the side, truncated as seen from above. Antennal notch open, defined by a triangular antennal tooth. The dorsal surface of the carapace has a pair of strong cristiform ridges, which, starting from the hind margin, diverge anteriorly and then converge on to the sides of the pseudorostrum; between the crests the dorsal surface is nearly flat. The ocular lobe is nearly twice as broad as long. The eye is without pigment.

The free thoracic somites have each a pair of dorso-lateral crests, in line with those on the carapace, becoming indistinct on the last somite. The pleural plates of the third somite are not greatly expanded laterally and there is no great interval between the second and third pairs of legs. The abdomen is about as long as the cephalo-thoracic region. The penultimate somite is little longer than the preceding. The last somite is flattened and broader than long.

The telson is a little shorter than the last somite and its breadth is five-sixths of its length.

The antennules have the first segment of the peduncle longer than the other two together and the second more than half as long as the third. The outer flagellum is composed of two segments, the inner of three.

The antennæ have three segments, the third longer than the preceding.

The mandibles are of the usual shape. The maxillular palp is short and carries two setæ, both broken in the specimen dissected, but apparently unusually short.

The first and second maxillipeds resemble those of *G. carinata* in having long setæ springing from the distal segments. The branchial apparatus appears to have no lobules.

The third maxilliped has no exopod; the basis is little more than twice as long as broad, slightly expanded and produced distally; the propodus is shorter than the carpus.

The first legs extend well in front of the pseudorostrum; the basis is strongly bent and is about half as long as the distal segments together; the carpus is twice as long as the two preceding segments together; the propodus is less than half as long as the carpus and bears a series of about nine very long setæ on the distal part of its inner edge; the dactylus is little more than half as long as the propodus, and has one very long and some shorter terminal setæ.

The second legs have the basis about twice as long as broad and a little longer than the remaining segments together; the ischium is very short and easily overlooked; the dactylus is a little longer than the propodus and bears a short curved terminal claw; all the segments of the limb are setose, especially on the inner surface.

The remaining legs are stout and subequal in length; the basis is about equal to the remaining segments together; the merus is slightly inflated and longer than the last three segments, which are very short; the dactylus is curved and ends in a strongly-curved claw.

The uropods have the peduncle less than twice as long as the last somite and about twice as long as the telson, thickened distally, where the diameter is about one-third of the length, minutely setose, and with a distal spine internally. The exopod is a little more than half as long as the peduncle and has a long and slender terminal spine. The endopod is one and a quarter times as long as the exopod, of two segments, the distal a little longer than the proximal, with a slender terminal spine, one spinule on the inner edge of the first and two on the second segment.

Adult Male.—Total length 1·7 mm.

The dorsal outline of the carapace, seen from the side, is more evenly arched than in the female, not sloping in front, where the dorsal surface is convex from side to side and projects above the dorso-lateral crests. The pseudorostrum is a little more obtuse than in the female, and its upper edge slopes downwards. The ocular lobe is more prominent. The crests of the carapace and of the leg-bearing somites are disposed as in the female.

The antennæ reach only to the hinder edge of the carapace, by which, in the natural position, they are wholly concealed.

The third maxilliped has a well-developed exopod. The first legs are a little shorter than in the female. All the legs, except the last pair, have exopods.

The uropods are relatively a little longer than in the female, the difference in length of the rami is less, and their terminal spines are longer; the inner edge of the endopod has two spinules on the proximal segment and three on the distal.

Remarks.—This species differs greatly in general appearance from the other members of the genus; the short and stout cephalothoracic region, the presence of only a single pair of ridges on the carapace, and the reduction of the interval between the second and third pairs of legs in the female are all well-marked distinctions.

Occurrence.—Gulf of Siam, "Koh Kam, 5–10 fathoms, 2/00," "Between Koh Mesan and Cape Liant, 5–8 fathoms, 7/2/00." Th. Mortensen Coll. Japan, "33° 10′ N., 129° 18′ E., 40 fathoms, 7/9/97, Suenson Coll." Copenhagen Museum. Co-types in British Museum.

PARADIASTYLIS LONGIPES Calm.

Paradiastylis longipes Calman, Cumacea of Siboga Expedition, p. 21, figs. 4 *a–i* (1905).

Occurrence.—Gulf of Siam, "Koh Kam, 5–10 fathoms, 2/00," "Between Koh Mesan and Cape Liant, 5–8 fathoms, 7/2/00." Th. Mortensen Coll. Copenhagen Museum and British Museum.

Genus COLUROSTYLIS, gen. nov.

Pleural plates of third and fourth free thoracic somites expanded backwards, third legs separated from second in adult female; telson very small, flattened, without spines; third maxillipeds with exopods in both sexes; third and fourth legs with vestigial exopods in female; two pairs of biramous pleopods in male; endopod of uropods of two segments.

Type-species *C. pseudocuma*, sp. n.

In addition to the form and size of the telson, the general form of the body in the species described below is strongly suggestive of the genus *Pseudocuma*, and, in fact, almost the only character visible without dissection to forbid its inclusion in that genus is the segmented endopod of the uropods. An affinity with the Diastylidæ is suggested by a number of small characters, of which the chief are the segmented inner flagellum of the antennule, the modification of the antennular peduncle and of the telson in the male, the triarticulate antenna in the female, the distally expanded basis of the third maxilliped, and the biramous pleopods in the male. The sum of these characters, however, does not remove the impression that the resemblance to the Pseudocumidæ is more than superficial and that the distinction between that family and the Diastylidæ is of diminishing importance.

COLUROSTYLIS PSEUDOCUMA, sp. n. (Plate XXXVI. figs. 23–36.)

Description of adult Female.—Total length 2·1 mm. (larger specimens to 2·3 mm.).

Carapace about two-sevenths of total length; its vertical height two-thirds of its length; dorsal edge slightly curved. Pseudorostrum straight, acute, horizontal or slightly raised. Antennal notch obsolete, antero-lateral corner rounded. Surface of carapace marked with very shallow broad pits. The ocular lobe is shaped much as in *Pseudocuma longicornis*. The eye is without pigment in the specimens examined. The free thoracic somites are deeper than the carapace anteriorly, the pleural plates of the third curved backwards so as to separate the third pair of legs widely from the second. The abdomen is a little shorter than the cephalothoracic region. The telson is about two-thirds as long as the last somite, obtusely pointed posteriorly, carrying a very few minute setæ but without spines.

The antennules have the first segment of the peduncle longer than either the second or third; the outer flagellum is about equal to the last segment of the peduncle, of three segments, the terminal very small; the inner flagellum is about equal to the first segment of the outer, also composed of three segments, the first and third minute. The antennæ are distinctly divided into three segments, the first bearing two setæ, the second and third one each.

The mouth-parts resemble those of *Pseudocumæ*. The mandible has about nine spines.

The third maxillipeds have the basis expanded at the distal end and slightly produced, bearing on its distal edge a series of about four plumose setæ.

First pair of legs broken off in all the specimens seen.

Second legs with the basis about three-fourths as long as the distal segments together; dactylus short, not twice as long as propodus.

Third and fourth pairs of legs with the basis shorter than the distal segments together, bearing near its base an exopod of two segments, not much less than half the length of the segment from which it springs. Last pair of legs not much shorter than the preceding pair.

The uropods have the peduncle more than twice as long as the last somite, with a single spinule at its distal inner corner; the rami are subequal, shorter than the peduncle. The exopod has a long terminal spine, with two short ones on either side of it. The endopod is composed of two segments, the proximal shorter than the distal, fringed with fine setæ on the inner edge, and with a terminal spine and three or four spinules on the distal part of the inner edge partly hidden among the setæ.

Adult Male.—Total length 2·7 mm.

Carapace nearly one-third of total length, its vertical height about half of its length. The free thoracic somites not so deep as in the female; second and third pairs of legs not separated. The penultimate thoracic somite has a marked median dorsal keel. The posterior corners of the last somite are slightly produced and acute. The telson is about three-fourths as long as the last abdominal somite; it is produced well beyond the anal valves, the post-anal part forming a tongue-shaped lobe, of which the outline is continued forwards by two ridges on the dorsal surface of the telson. Two small setæ spring from the under surface, close to the tip, and there are some very fine setæ below the lateral margins.

The antennules have the peduncle slightly increasing in diameter distally, the first segment almost as long as the other two together, the last segment as broad as it is long and bearing a dense tuft of sensory filaments; the outer flagellum is more than half as long as the peduncle and consists of four subequal segments; the inner flagellum is more than half as long as the outer and also consists of four segments, of which the first and last are very small. The antennæ are about as long as the body; the last two segments of the peduncle are indistinctly separated and the sensory setæ which they bear are small and few in number.

Both pairs of pleopods are biramous, the outer ramus in each case of two segments.

The uropods have the peduncle nearly three times as long as the last segment, with about nine spinules interspersed with minute setæ on the inner edge; the rami are less than two-thirds as long as the peduncle; the endopod has on the inner edge six spinules on the first segment and seven on the second, with very minute setæ between.

Occurrence.—New Zealand, "Lyttleton Harbour, 1–5 fathoms, 8/97," "Akaroa Harbour, 6 fathoms, 8/97." H. Suter Coll., Copenhagen Museum. Co-types in British Museum.

Genus Diastylopsis S. I. Smith.

The two species described below conform in general characters to Zimmer's re-definition of this genus (Cumaceen der Deutschen Tiefsee-Exp. p. 189, 1908), except in having a very inconspicuous antennal notch. This character, combined with the elongated and perfectly smooth carapace, without teeth or ridges on the surface, suffices to distinguish them from all the species referred to the genus.

DIASTYLOPSIS ELONGATA, sp. n. (Plate XXXVII. figs. 1–12.)

Description of adult Female.—Total length 9·2 mm.

Carapace a little more than one-fourth of total length, compressed, its vertical height less than half its length; dorsal edge very slightly arched. Pseudorostrum straight, acute, slightly raised so as to form a very obtuse angle with the dorsal edge, about one-fifth of total length of carapace. Antennal notch slightly marked. Antero-lateral corner rounded and rather coarsely serrated. Ocular lobe with a minute terminal tooth projecting above the dorsal outline of the carapace. No distinct eye. Surface of carapace smooth.

The five leg-bearing somites are all distinct; the second is much longer than the first; the third and fourth are strongly expanded backwards at the sides, and a wide interval is left between the second and third pairs of legs.

The abdomen is about as long as the cephalothoracic region, rather slender, the fifth somite about twice as long as deep; first somite with a prominent, backwardly-curved tooth in the middle of the sternal surface; fifth somite with the postero-lateral angles spiniform.

Telson a little shorter than the last somite, its post-anal part much narrowed, the width at the level of the proximal pair of lateral spines being about one-eighth of its length; there are about eight pairs of short lateral spines, occupying about two-fifths of the lateral edge; the terminal spines are short.

Antennules with the first segment of the peduncle stout, expanding distally, shorter than the other two together; the second much stouter than, and more than half as long as, the third; the outer flagellum composed of three and the inner of two segments, with perhaps a minute terminal segment in each case.

The antenna is composed of three segments.

The mouth-parts are of normal type. The mandible has an elongated body and about twelve spines on the inner edge. The palp of the maxillula is bisetose. The basis of the third maxilliped is twice as long as the distal segments together, hardly expanded distally, carrying a well-developed exopod.

The first legs extend beyond the tip of the pseudorostrum by little more than the terminal segment; the basis is longer, by more than one-third, than the distal segments together, and has a row of denticles on its lower surface and a tooth at its distal inner corner; the carpus and propodus are subequal, and each a little longer than the dactylus.

The second legs have the basis a little less than one-third longer than the distal segments together, with a small tooth at its distal inner corner; the ischium and merus have the inner edge produced distally as a slight tooth; the merus is two-thirds as long as the carpus and a little shorter than the propodus and dactylus together.

The third and fourth pairs of legs have minute exopods, each of two segments. The coxa of the third pair is broadened in an antero-posterior direction, its distal edge is serrated, and the basis is attached near its posterior end; the basis has a small tooth on the anterior side at its distal end. The fifth pair of legs are much shorter than the fourth.

The peduncle of the uropods is a little more than half as long again as the telson, and has about seven spines on the distal part of its inner edge; the subequal rami are a little longer than two-thirds of the peduncle. The endopod is distinctly divided into three segments, the first longer than the other two together; there are numerous short spines on the inner edge, and the apical spine is short. The exopod bears setæ terminally and on the outer edge.

Adult Male.—Total length 9 mm.

The dorsal edge of the carapace is nearly straight and the pseudorostrum is horizontal. The ocular lobe is slightly prominent on the dorsal surface as seen from the side, but has no terminal tooth. The third and fourth leg-bearing somites are less strongly produced backwards than in the female, and there is no marked interval between the second and third pairs of legs. The last thoracic somite has the postero-lateral corners produced as short spines. The ventral spine of the first abdominal somite is bifid. The telson, which has the usual dorsal prominence, is about as long as the last somite.

The peduncle of the antennules has the terminal segment stouter than in the female, and carrying a tuft of sensory filaments; the outer flagellum has five and the inner three segments, apart from a doubtful terminal segment in each case.

The antennæ have the usual structure; the sensory filaments on the anterior surface of the peduncle are very short; the flagellum, broken in the specimen figured, appears to be as long as the body.

The second legs have the distal segments more elongated than in the female, together hardly shorter than the basis; the carpus is nearly twice as long as the merus; the propodus is stouter and longer than the dactylus, and the latter bears terminally two small curved claws, which are absent in the female. In the third and fourth pairs of legs the basis is produced into a strong tooth at its distal end anteriorly. In the fourth and fifth pairs (but not in the third) the ischium is produced posteriorly in a tooth-like process.

Both pairs of pleopods are biramous, with the exopod of two segments.

The exopod of the uropods is slightly shorter than the endopod; there are numerous spinules on the inner edge of the latter and of the peduncle.

Occurrence.—New Zealand, "Lyttleton Harbour, 1–5 fathoms, H. Suter Coll., 8/97," "Akaroa Harbour, H. Suter." Copenhagen Museum. Co-types in British Museum.

DIASTYLOPSIS CRASSIOR, sp. n. (Plate XXXVII. figs. 13–18.)

Description of adult Female.—Total length 9·25 mm.

Closely resembling *D. elongata*. The slightly curved dorsal outline of the carapace is continued without a break by the upper edge of the pseudorostrum. The ocular lobe is not prominent dorsally, and has no tooth. The pseudorostrum is less acutely pointed than in *D. elongata*.

Abdominal somites much stouter than in *D. elongata*, the fifth somite less than one and a half times as long as deep. First somite without any median tooth on the ventral side (only in one specimen a minute median denticle was observed), but with two ventro-lateral rows of denticles. Postero-lateral angles of third, fourth, and fifth somites spiniform.

Telson much less narrowed distally than in *D. elongata*, its width at the level of the proximal pair of spines nearly one-fourth of its length; there are seven or eight spines on each side and the terminal spines are short.

The antennules are relatively a little longer than in *D. elongata*. The mouth-parts show no differences of importance.

The first legs have the spines on the lower surface of the basis stronger and more numerous than in *D elongata*. The basis of the second legs is little shorter than the distal segments together and has some teeth on its lower surface and outer edge and a strong tooth at its distal inner corner; the ischium is produced on the inner side into two and the merus into three strong teeth; the merus is a little more than half as long as the carpus, and equal to the propodus and dactylus together.

The succeeding pairs of legs are stouter and longer than in *D. elongata*. The tooth at the distal end of the basis in the third and fourth is strong and, in some cases, bifid.

The peduncle of the uropods is twice as long as the telson and has six spines, much longer than those of *D. elongata*, on its inner edge; the exopod is distinctly longer than the endopod, which is about two-thirds as long as the peduncle; the spines on the inner edge of the peduncle are longer than in *D. elongata*.

Remarks.—This species is very closely allied to, but I believe distinct from, *D. elongata*, in company with which it occurred. It differs from that species in the stouter abdomen (which is very conspicuous when specimens of similar size are compared), in the very different spinous armature on the under side of the first abdominal somite, in the form of the telson, and in the stronger spines on the legs, especially on the second pair.

Occurrence.—New Zealand, "Lyttleton Harbour, 1–5 fathoms, H. Suter Coll., 8/97." Copenhagen Museum. Co-types in British Museum.

Genus Diastylis.

The genus *Diastylis*, as it stands at present, is hardly more than a convenient receptacle for unclassified Diastylidæ, and this alone can excuse the temporary assignment to it of the remarkable form here described from immature specimens as *Diastylis* (?) *fistularis*. The other new species is a typical *Diastylis*, or, rather, it belongs to the group which we may assume to be typical until Say's *D. arenaria* is rediscovered.

Diastylis koreana, sp. n. (Plate XXXVII. figs. 19–25.)

Description of adult Female.—Total length 12 mm.

Carapace about one-third of total length, its vertical height a little less than half its length, widest behind, where the width is about two-thirds of its length; dorsal surface arched, slightly uneven in front and with a median depression posteriorly between the branchial regions; the whole surface beset with setæ, among which are minute spiniform points, most conspicuous on the anterior part of the dorsal surface. Pseudorostrum slender, slightly curved as seen from the side, nearly one-third of total length of carapace. Antennal notch obsolete, lower margin minutely dentate anteriorly. Ocular lobe very small or absent; no distinct eye.

The free thoracic somites are rather less thickly setose than the carapace; the last thoracic somite has the posterior corners not produced, rounded, with a minute terminal spinule.

The abdomen is about as long as the cephalothoracic region; the first five somites have the lateral corners produced and spiniform, and each bears a pair of small dorsolateral teeth.

The telson is as long as the last two somites together; the post-anal part is a little shorter and much narrower than the pre-anal, and bears on each side about ten long, slender, almost setiform, lateral spines; the terminal spines are a little stouter and, like the lateral spines, curved upwards.

The antennules are rather slender and the peduncle reaches to the tip of the pseudorostrum; the first and third segments are subequal and longer than the second; the flagella were imperfect in all the adult specimens examined.

The first legs extend beyond the pseudorostrum by the length of their two distal segments; the basis is two-thirds as long as the distal segments together, and carries numerous long plumose hairs; there are a few small teeth on its lower surface; the propodus is longer than the carpus and nearly twice as long as the dactylus.

The second legs have the basis a little shorter than the distal segments together, carrying long plumose setæ; the carpus is longer by one-half than the propodus and dactylus together.

The last three pairs of legs are stout, with numerous strong setæ on the distal segments; the merus is produced distally on the outer or posterior side of its articulation with the carpus into a rounded tubercle.

The uropods are slender, the peduncle about as long as the telson, with about twelve spinules on the inner edge. The exopod is shorter than the endopod, and curved. The endopod is about half as long as the peduncle, distinctly divided into three segments, of which the first is longer than the other two together; the inner edge has about eleven spinules, and the short terminal spine is distinctly defined.

Remarks.—The hairiness of the carapace gives this species some resemblance to *D. goodsiri* *, which it further resembles in the acutely produced lateral angles of the abdominal somites and in the length and slenderness of the lateral spines on the telson. It differs in the form of the carapace, which is narrowed in front, in the great length of the pseudorostrum, and in the proportions of the telson. The knob-like prominence on the merus of the last three pairs of legs appears also to be a distinctive character.

Occurrence.—"Korea, 35 fathoms, Suenson Coll., 22/1/82." Copenhagen Museum. Co-types in British Museum.

Diastylis (?) fistularis, sp. n. (Plate XXXVII. figs. 26–36.)

Description of young Specimen (? Male).—Total length 3·1 mm.

Carapace about one-third of total length, its vertical height about one-half of its length, subcylindrical, abruptly narrowed in front as seen from above; dorsal surface slightly arched, rather flattened anteriorly. Pseudorostrum straight, acutely pointed. Antennal notch hardly indicated. Posteriorly the surface of the carapace bears four longitudinal ridges on each side; anteriorly on each side is a vertical ridge forming a marked "shoulder" when viewed from above; from the upper end of the vertical ridge an obliquely longitudinal ridge runs backwards and curves towards the median line about the middle of the dorsal surface. The ocular lobe is a little broader than long and is without pigment or definite corneal facets.

The first free thoracic somite is partly concealed laterally; the third and fourth are not distinctly separated on the dorsal surface.

The abdomen, including the telson, is longer by one-third than the cephalothoracic region; the fifth somite is hardly longer than the preceding; the sixth is longer than the fifth, somewhat flattened, hardly longer than broad, with the uropods articulated about the middle of its length.

The telson is about as long as the last four somites together, and two-thirds their thickness. It is cylindrical in form, with a slight dorsal curvature, and bluntly pointed

* Sars states (Crust. Norway, iii. p. 54) that in *D. goodsiri* the surface of the carapace is "without any spines or denticles." Hansen, on the other hand, describes it as "tact besat med meget fine skarpe og spidse Kegler." A fine specimen, received from the Copenhagen Museum, agrees with Dr. Hansen's description in this respect.

at the tip. The anus is terminal and the anal valves are placed as in *D. tubulicauda*, although they are not so well marked as in that species. The apex of the telson on the dorsal side of the anus is without spines and has only a single lateral pair of fine setæ.

The antennules are about three-fourths as long as the carapace; the first segment of the peduncle is a little longer than either of the other two; the outer flagellum is more than one-third of the length of the peduncle and more than twice as long as the inner.

The antennæ have a large fusiform terminal segment which may possibly represent the developing flagellum of the male sex.

The mouth-parts appear to present no noteworthy divergences from the usual type. The branchial plates have about four lobules and others in course of development.

The third maxillipeds have small exopods, without setæ, and obscurely divided into two segments; the basis is greatly expanded distally and is produced into a broad lobe which reaches nearly to the end of the carpus.

The first legs are long and slender, about half of the carpus extending beyond the pseudorostrum; the basis is a little less than half as long as the distal segments together; the carpus is a little shorter than the propodus, which is nearly three times as long as the dactylus.

The second legs have the basis narrowed distally, a little shorter than the distal segments together, the carpus about equal to the dactylus and three times as long as the propodus.

The third and fourth pairs of legs are long and stout. Each bears an exopod, about one-third of the length of the basis, indistinctly divided into two segments, and carrying a single terminal seta. The fifth pair of legs are only two-thirds as long as the preceding pair, without exopods, and with fewer setæ.

The uropods hardly extend beyond three-fourths of the length of the telson; the peduncle has three minute setæ on the distal part of its inner edge. The exopod is a very little longer than the endopod and more than half the length of the peduncle; its apical setæ are long and slender. The endopod has three segments, the first occupying more than half its length, with four small spines on the inner edge and a slender terminal spine.

In a specimen 1·7 mm. in total length the last thoracic somite is still without appendages, the endopod of the uropods consists of only two segments, and the exopods on the third and fourth pairs of legs and on the third maxillipeds are extremely small.

A specimen of which the total length cannot have been less than 6 mm. is unfortunately represented only by the abdomen and the posterior thoracic somites. It has no exopods on the third and fourth pairs of legs.

Remarks.—In the great size and tubular form of the telson this species resembles *D. tubulicauda* Calman (Cumacea, in Fisheries, Ireland, Sci. Invest. 1904, i. (1905)

p. 46, pl. v. figs. 82–86). The unique type-specimen of that species, like the two smaller of the specimens described above, has minute exopods on the third and fourth pairs of legs, and, like the smallest, is without appendages on the last thoracic somite; on the other hand, it possesses a well-developed exopod on the third maxilliped where the present specimens have only a rudiment. The new species further differs in having no apical spines on the telson, a character in which it approaches *Pachystylis rotundata* of Hansen.

Only the discovery of adult specimens will allow the generic position to be decided, but the characters of the form here described are so striking that there can be little difficulty in recognising the species again.

Occurrence.—Gulf of Siam, "Between Koh Mesan and Cape Liant, 9 fathoms," "Koh Kam, 10 fathoms," "Koh Chuen, 30 fathoms." Th. Mortensen Coll., Copenhagen Museum. Co-type in British Museum.

Diastylis insularum Calm.

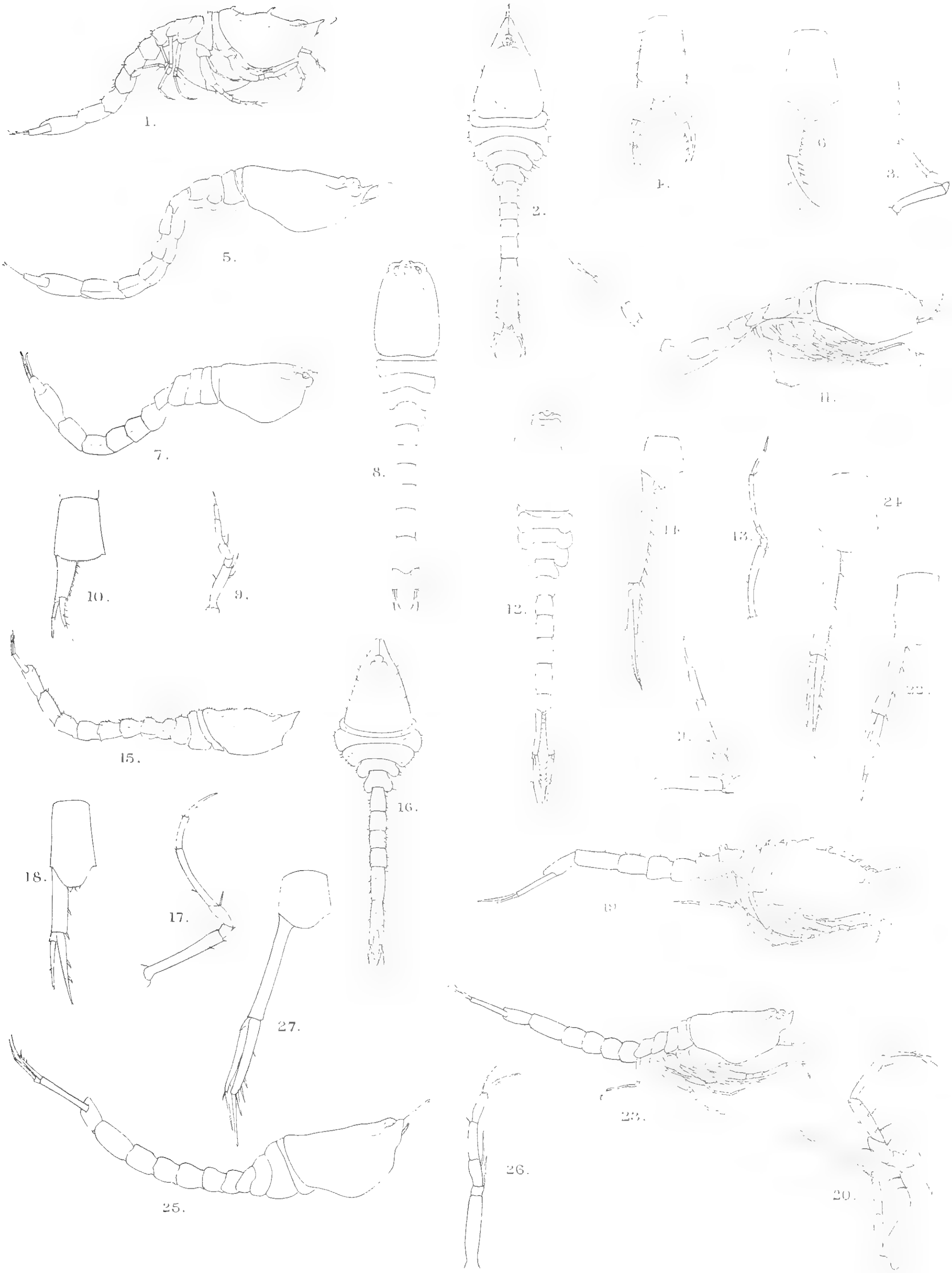
Leptostylis (?) *insularum,* Calman, Ann. Mag. Nat. Hist. (8) i. p. 234, figs. 1–5 *a* (1908).

Occurrence.—"Lyttleton Harbour, New Zealand, 1–5 fathoms, 8/97. H. Suter Coll." Copenhagen Museum and British Museum.

PLATE XXXII.

PLATE XXXII.

Fig. 1. *Cumella forficula* (p. 345). Female. From the side.
2. ,, ,, ,, From above.
3. ,, ,, ,, Fifth leg.
4. ,, ,, ,, Last somite and uropods.
5. ,, ,, Male. From the side (appendages omitted).
6. ,, ,, ,, Last somite and uropods.
7. *Cumella clavicauda* (p. 346). Male. From the side (appendages omitted).
8. ,, ,, ,, From above.
9. ,, ,, ,, Fifth leg.
10. ,, ,, ,, Last somite and uropod.
11. *Cumella leptopus* (p. 347). Male. From the side.
12. ,, ,, ,, From above.
13. ,, ,, ,, Fifth leg.
14. ,, ,, ,, Last somite and uropod.
15. *Cumella hispida* (p. 347). Female. From the side (appendages omitted).
16. ,, ,, ,, From above.
17. ,, ,, ,, Fifth leg.
18. ,, ,, ,, Last somite and uropod.
19. *Cumella serrata* (p. 348). Female. From the side.
20. ,, ,, ,, First leg.
21. ,, ,, ,, Fifth leg.
22. ,, ,, ,, Last somite and uropod.
23. ,, ,, Male. From the side.
24. ,, ,, ,, Last somite and uropod.
25. *Cumella lævis* (p. 350). Female. From the side (appendages omitted).
26. ,, ,, ,, Fifth leg.
27. ,, ,, ,, Last somite and uropod.



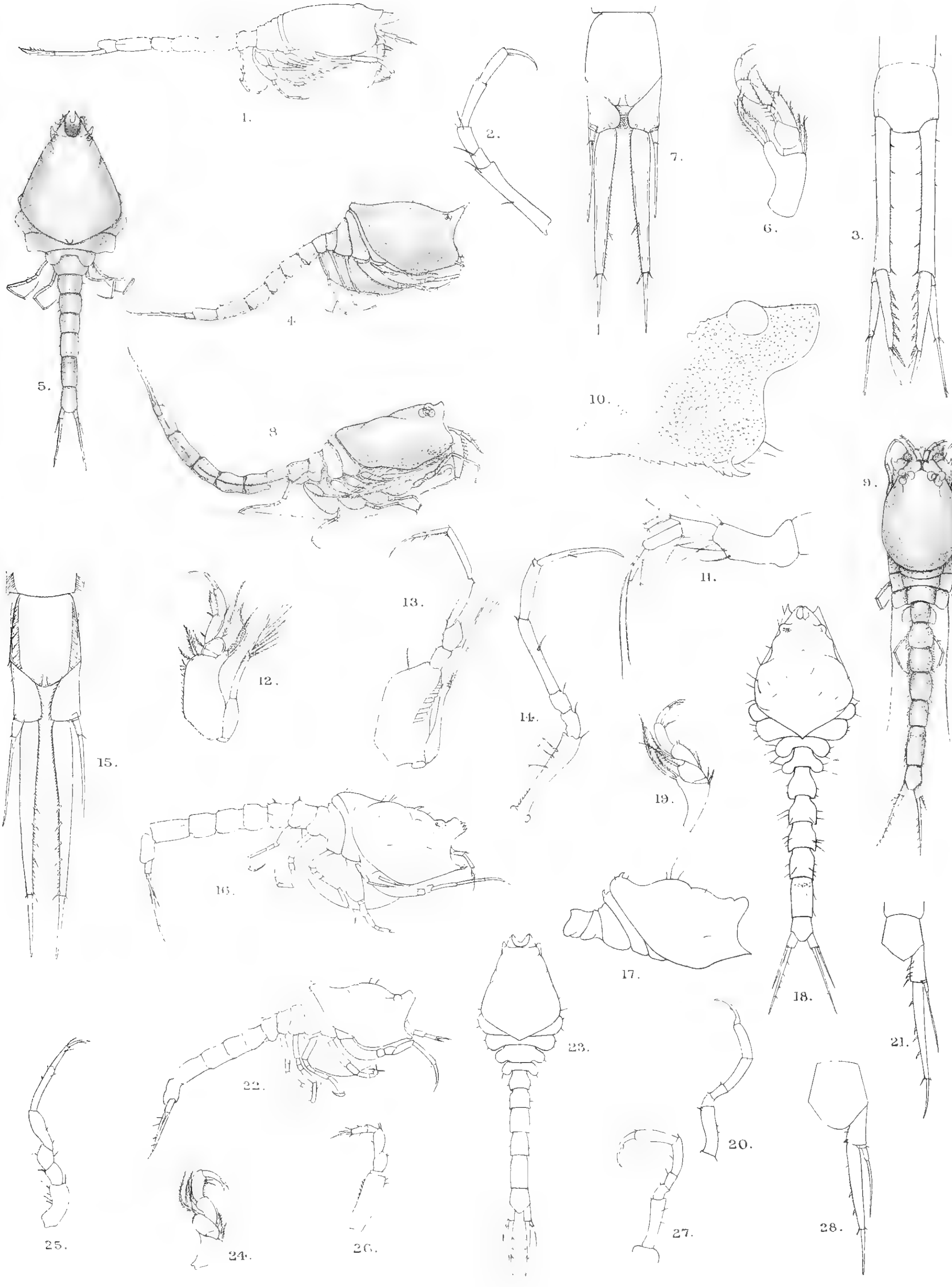
W. T. Calman del.

1–6. CUMELLA FORFICULA. 7–10. C. CLAVICAUDA. 11–14. C. LEPTOPUS.
15–18. C. HISPIDA. 19–24. C. SERRATA. 25–27. C. LAEVIS.

PLATE XXXIII.

PLATE XXXIII.

Fig. 1.	*Nannastacus lepturus* (p. 352).	Male.	From the side.
2.	,, ,,	,,	Fifth leg.
3.	,, ,,	,,	Last somite and uropod.
4.	*Nannastacus zimmeri* (p. 352).	Female.	From the side.
5.	,, ,,	,,	From above.
6.	,, ,,	,,	Third maxilliped.
7.	,, ,,	,,	Last somite and uropods.
8.	,, ,,	Male.	From the side.
9.	,, ,,	,,	From above.
10.	,, ,,	,,	Antero-lateral part of carapace.
11.	,, ,,	,,	Antennule.
12.	,, ,,	,,	Third maxilliped.
13.	,, ,,	,,	First leg.
14.	,, ,,	,,	Fifth leg.
15.	,, ,,	,,	Last somite and uropods.
16.	*Nannastacus gibbosus* (p. 355).	Female.	From the side.
17.	,, ,,	,,	Outline of cephalothoracic region from another specimen.
18.	,, ,,	,,	From above.
19.	,, ,,	,,	Third maxilliped.
20.	,, ,,	,,	Fifth leg.
21.	,, ,,	,,	Last somite and uropod.
22.	*Nannastacus reptans* (p. 356).	Female.	From the side.
23.	,, ,,	,,	From above.
24.	,, ,,	,,	Third maxilliped.
25.	,, ,,	,,	First leg.
26.	,, ,,	,,	Second leg.
27.	,, ,,	,,	Fifth leg.
28.	,, ,,	,,	Last somite and uropod.



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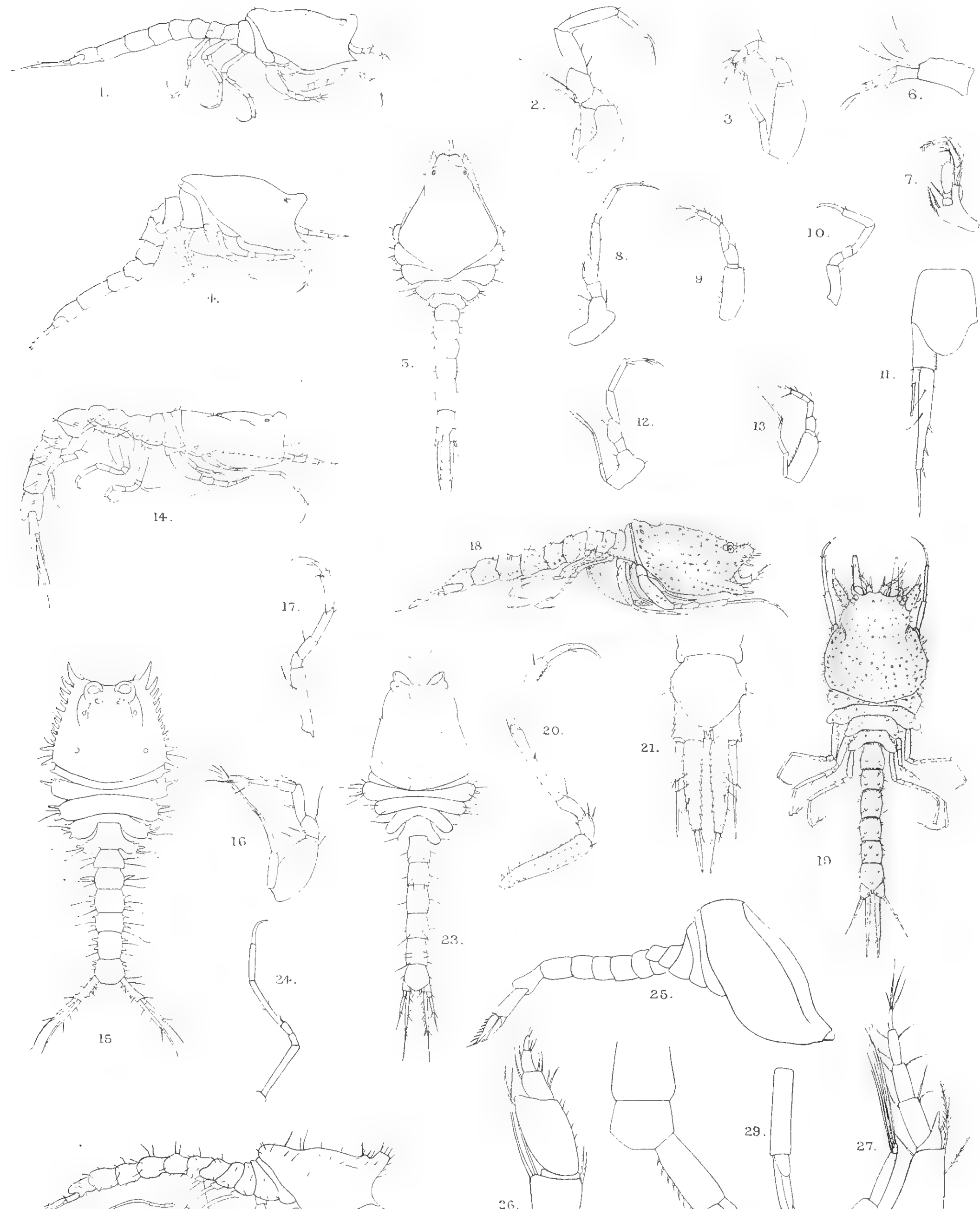
1—3. NANNASTACUS LEPTURUS. 4—15. N. ZIMMERI.
16—21. N. GIBBOSUS. 22—28. N. REPTANS.

PLATE XXXIV.

PLATE XXXIV.

Fig. 1.	*Nannastacus minor* (p. 357).	Female.	From the side.
2.	,, ,,	,,	First leg.
3.	,, ,,	,,	Second leg.
4.	*Nannastacus tardus* (p. 359).	Female.	From the side.
5.	,, ,,	,,	From above.
6.	,, ,,	,,	Antennule.
7.	,, ,,	,,	Third maxilliped.
8.	,, ,,	,,	First leg.
9.	,, ,,	,,	Second leg.
10.	,, ,,	,,	Fifth leg.
11.	,, ,,	,,	Last somite and uropod.
12.	*Nannastacus agnatus* (p. 360).	Female.	First leg.
13.	,, ,,	,,	Second leg.
14.	*Schizotrema depressum* (p. 361).	Female.	From the side.
15.	,, ,,	,,	From above.
16.	,, ,,	,,	Second leg.
17.	,, ,,	,,	Fifth leg.
18.	*Schizotrema bifrons* (p. 362).	Female.	From the side.
19.	,, ,,	,,	From above.
20.	,, ,,	,,	Fifth leg.
21.	,, ,,	,,	Last somite and uropods.
22.	*Schizotrema sordidum* (p. 363).	Female.	From the side.
23.	,, ,,	,,	From above.
24.	,, ,,	,,	Fifth leg.
25.	*Campylaspis platyuropus* (p. 364).	Female.	From the side (appendages omitted).
26.	,, ,,	,,	Third maxilliped (exopod omitted).
27.	,, ,,	,,	First leg.
28.	,, ,,	,,	Last somite and uropod, from above.
29.	,, ,,	,,	Uropod, from the side.



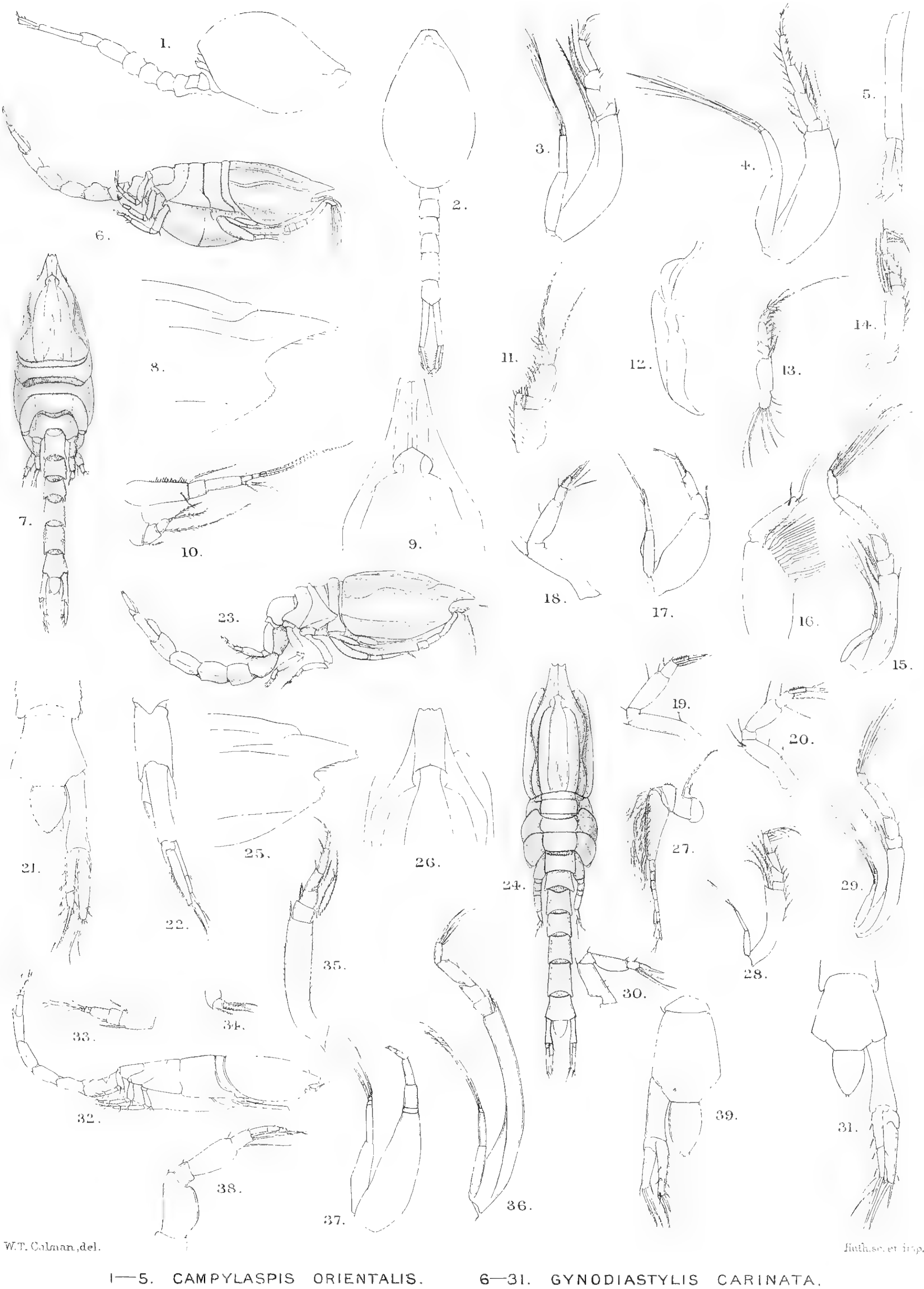
W.T. Calman, del.

1–3. NANNASTACUS MINOR. 4–11. N. TARDUS. 12–13. N. AGNATUS.
14–17. SCHIZOTREMA DEPRESSUM. 18–21. S. BIFRONS.
22–24. S. SORDIDUM. 25–29. CAMPYLASPIS PLATYUROPUS.

PLATE XXXV.

PLATE XXXV.

Fig. 1.	*Campylaspis orientalis* (p. 365).	Female.	From the side (appendages omitted).
2.	,, ,,	,,	From above.
3.	,, ,,	,,	Third maxilliped.
4.	,, ,,	,,	First leg.
5.	,, ,,	,,	Uropod.
6.	*Gynodiastylis carinata* (p. 368).	Female.	From the side.
7.	,, ,,	,,	From above.
8.	,, ,,	,,	Anterior part of carapace, from the side.
9.	,, ,,	,,	,, ,, from above.
10.	,, ,,	,,	Antennule and antenna.
11.	,, ,,	,,	First maxilliped.
12.	,, ,,	,,	Branchial apparatus.
13.	,, ,,	,,	Second maxilliped.
14.	,, ,,	,,	Third maxilliped.
15.	,, ,,	,,	First leg.
16.	,, ,,	,,	Distal segments of same, further enlarged.
17.	,, ,,	,,	Second leg.
18.	,, ,,	,,	Third leg.
19.	,, ,,	,,	Fourth leg.
20.	,, ,,	,,	Fifth leg.
21.	,, ,,	,,	Last somite, telson, and uropod, from above.
22.	,, ,,	,,	,, ,, ,, from side.
23.	,, ,,	Male.	From the side.
24.	,, ,,	,,	From above.
25.	,, ,,	,,	Anterior part of carapace, from the side.
26.	,, ,,	,,	,, ,, from above.
27.	,, ,,	,,	Antenna.
28.	,, ,,	,,	Third maxilliped.
29.	,, ,,	,,	First leg.
30.	,, ,,	,,	Third leg.
31.	,, ,,	,,	Last somite, telson, and uropod.
32.	*Gynodiastylis lævis* (p. 371).	Female.	From the side.
33.	,, ,,	,,	Antennule.
34.	,, ,,	,,	Antenna.
35.	,, ,,	,,	Third maxilliped.
36.	,, ,,	,,	First leg.
37.	,, ,,	,,	Second leg.
38.	,, ,,	,,	Fifth leg.
39.	,, ,,	,,	Last somite, telson, and uropod.



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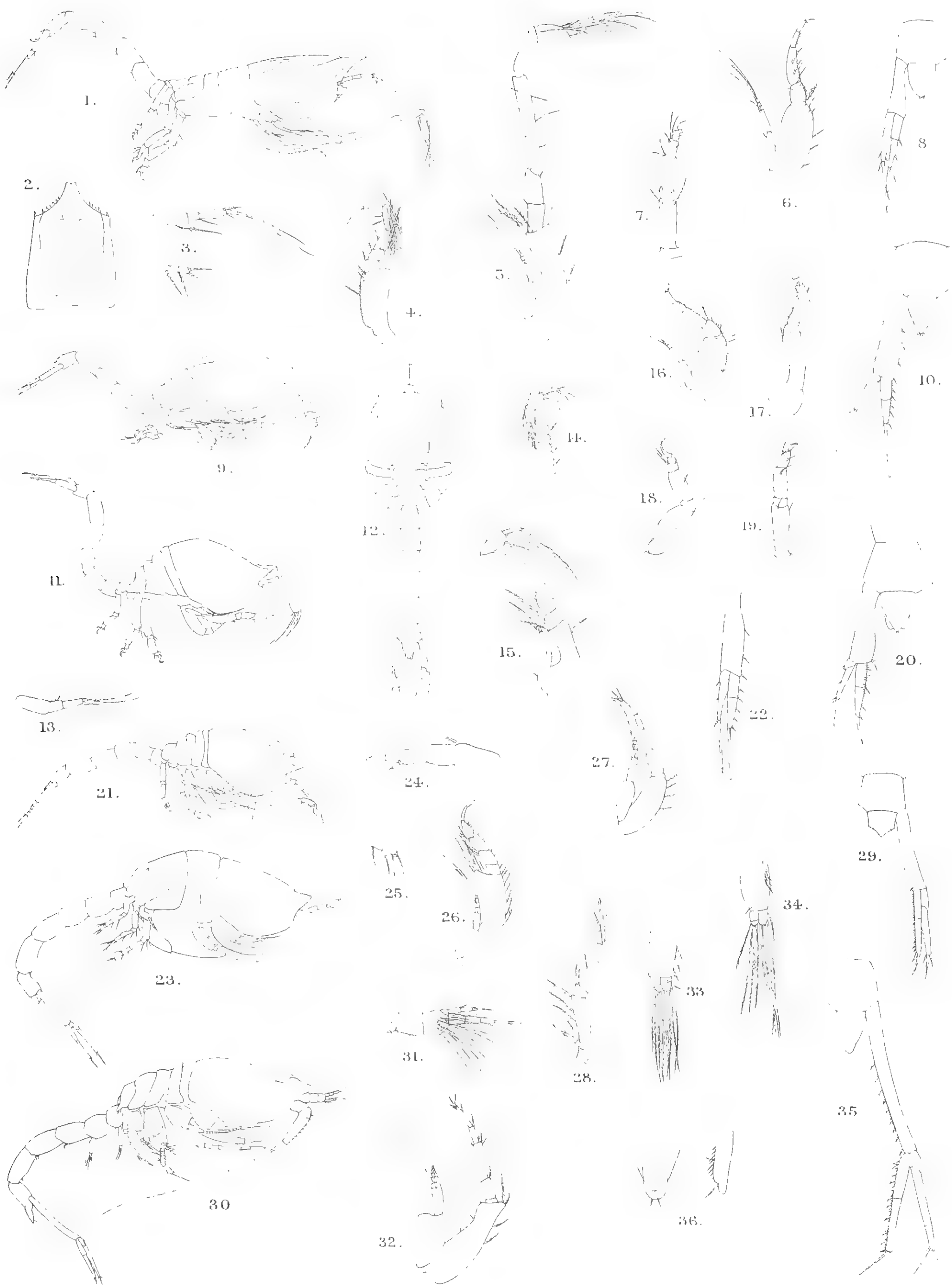
1—5. CAMPYLASPIS ORIENTALIS. 6—31. GYNODIASTYLIS CARINATA.
32—39. G. LAEVIS.

PLATE XXXVI.

PLATE XXXVI.

Fig. 1. *Gynodiastylis costata* (p. 372). Female. From the side.
2. ,, ,, ,, Carapace, from above.
3. ,, ,, ,, Antennule and antenna.
4. ,, ,, ,, Third maxilliped.
5. ,, ,, ,, First leg.
6. ,, ,, ,, Second leg.
7. ,, ,, ,, Fifth leg.
8. ,, ,, ,, Last somite, telson, and uropod.
9. ,, ,, Male. From the side.
10. ,, ,, ,, Last somite, telson, and uropod.
11. *Gynodiastylis bicristata* (p. 374). Female. From the side.
12. ,, ,, ,, From above.
13. ,, ,, ,, Antennule.
14. ,, ,, ,, Third maxilliped.
15. ,, ,, ,, First leg.
16. ,, ,, ,, Second leg.
17. ,, ,, ,, Third leg.
18. ,, ,, ,, Fourth leg.
19. ,, ,, ,, Fifth leg.
20. ,, ,, ,, Last somite, telson, and uropod.
21. ,, ,, Male. From the side.
22. ,, ,, ,, Uropod.
23. *Colurostylis pseudocuma* (p. 377). Female. From the side.
24. ,, ,, ,, Antennule.
25. ,, ,, ,, Antenna.
26. ,, ,, ,, Third maxilliped.
27. ,, ,, ,, Second leg.
28. ,, ,, ,, Third leg.
29. ,, ,, ,, Last somite, telson, and uropod.
30. ,, ,, Male. From the side.
31. ,, ,, ,, Antennule.
32. ,, ,, ,, Second leg.
33. ,, ,, ,, First pleopod.
34. ,, ,, ,, Second pleopod.
35. ,, ,, ,, Last somite, telson, and uropod.
36. ,, ,, ,, Apex of telson from above and from the side.



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I—10. GYNODIASTYLIS COSTATA. II—21. G. BICRISTATA.
22—36. COLUROSTYLIS PSEUDOCUMA.

PLATE XXXVII.

PLATE XXXVII.

Fig. 1.	*Diastylopsis elongata* (p. 379).	Female.	From the side.
2.	,, ,,	,,	First abdominal somite, from the side.
3.	,, ,,	,,	Antennule.
4.	,, ,,	,,	First leg.
5.	,, ,,	,,	Second leg.
6.	,, ,,	,,	Third leg.
7.	,, ,,	,,	Fifth leg.
8.	,, ,,	,,	Last somite, telson, and uropod.
9.	,, ,,	Male.	From the side.
10.	,, ,,	,,	Terminal part of second leg.
11.	,, ,,	,,	Fourth leg.
12.	,, ,,	,,	Last somite, telson, and uropod.
13.	*Diastylopsis crassior* (p. 381).	Female.	From the side.
14.	,, ,,	,,	First abdominal somite, from the side.
15.	,, ,,	,,	Second leg.
16.	,, ,,	,,	Third leg.
17.	,, ,,	,,	Fifth leg.
18.	,, ,,	,,	Last somite, telson, and uropod.
19.	*Diastylis koreana* (p. 382).	Female.	From the side.
20.	,, ,,	,,	Cephalothoracic region, from above.
21.	,, ,,	,,	Third and fourth abdominal somites, from above.
21 *a*.	,, ,,	,,	Antennule.
22.	,, ,,	,,	First leg.
23.	,, ,,	,,	Second leg.
24.	,, ,,	,,	Fourth leg.
25.	,, ,,	,,	Last somite, telson, and uropod.
26.	*Diastylis fistularis* (p. 383).	Young male (?).	From the side.
27.	,, ,,	,,	From above.
28.	,, ,,	,,	Antennule.
29.	,, ,,	,,	Antenna.
30.	,, ,,	,,	Third maxilliped.
31.	,, ,,	,,	First leg.
32.	,, ,,	,,	Second leg.
33.	,, ,,	,,	Third leg.
34.	,, ,,	,,	Fifth leg.
35.	,, ,,	,,	Uropod.
36.	,, ,,	,,	Apex of telson, from above and from the side.

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Huth, lith.

1—12. DIASTYLOPSIS ELONGATA. 13—18. D. CRASSIOR.
19—25. DIASTYLIS KOREANA. 26—36. D. FISTULARIS

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February, 1911.

P. CHALMERS MITCHELL,
Secretary.

TRANSACTIONS

OF

THE ZOOLOGICAL SOCIETY OF LONDON.

VOL. XVIII.—PART 5.

(PLATES XXXVIII.-XLIII. and Text-figures 85-87.)

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Continued on page 3 of Wrapper.

V. *On a Collection of Fishes from the Lake Ngami Basin, Bechuanaland.* *By* G. A. Boulenger, *F.R.S.*, *V.P.Z.S.*

[Received December 17, 1910; Read February 21, 1911.]

[Plates XXXVIII.–XLIII. and Text-figures 85–87.]

In his little book 'Mémoire sur les Poissons de l'Afrique Australe' (Paris, 1861), Count Francis de Castelnau gave the descriptions of a number of new fishes from Lake Ngami, then a lake of some importance discovered by Livingstone and Oswell. He had sent there one of his "préparateurs," Frédéric Daviaud, who brought back to Cape Town, where Castelnau was Consul, a number of dried specimens, probably accompanied by notes on the coloration, from which the descriptions were drawn up. The types of these are all lost, and as the definitions are inadequate, it has been impossible hitherto to allocate a position in the system to most of the species described by Castelnau.

Over forty years have elapsed since the publication of the 'Mémoire' quoted, and in the meanwhile no one seems to have collected fishes in the lake, which is rapidly drying up. I was therefore happy to hear, two years ago, through my colleague Mr. Ogilvie-Grant, that Mr. R. B. Woosnam was preparing an expedition to Bechuanaland, and that it might be possible to get at the lake for the purpose of obtaining a series of its fishes. An application having been made by Dr. P. L. Sclater to the Royal Society's Government Grant Committee, Mr. Woosnam was provided with the necessary means to extend his collecting-trip in that direction. Although unforeseen circumstances have prevented his reaching the lake itself, he has nevertheless been able to form a considerable collection of fishes from the Okovango river that flows into it, a collection by means of which I have been able to identify, with some approach to certainty, most of the species described by Castelnau, and thus remove a stumbling-block in African systematic ichthyology.

As Castelnau's little book is not easily procurable, I have reproduced most of the original descriptions, in order to enable others to judge of the degree of probability of my identifications, which, needless to say, in view of the unsatisfactory nature of Castelnau's work, are in some cases little more than guesses. On the other hand, a few of the species in Mr. Woosnam's collection could not be referred to any previously named, and are here described as new.

The Ngami Fish-fauna shows no feature differentiating it from that of the Zambesi, and not a few species are common to both. Although no striking discoveries have resulted from the Expedition, Mr. Woosnam is to be congratulated on having supplied a desideratum of long standing in African Ichthyology, which has made such rapid progress during the last few years. I beg to express to him my grateful thanks for all he has done.

The specimens in the collection number 87, referable to 25 species *. They are now preserved in the British Museum.

Mr. Woosnam's report is here appended, and I may add that the notes and coloured sketches he has made on the fishes in the fresh condition have been useful in drawing up descriptions of the new or imperfectly known species.

"With regard to the present small collection from Ngamiland, although the fish are labelled 'Lake Ngami' for the convenience of reference to maps, they come in reality from the Okovango river and vast extent of marshes (of which Lake Ngami is a part) into which the river opens out before it continues its way as a single great river known as the Botletle or Zouga.

"The physical geography of Ngamiland and the Kalahari Desert may shortly be said to consist of a great shallow basin or valley surrounded by higher land. There is only one outlet to the sea towards the Orange river. The lowest part of the whole central and North Kalahari basin is the Great Makarikari Salt Pan, and I am inclined to think that there is a low, broad ridge running across the Kalahari somewhere about 23° South, and forming a low watershed between the Okovango and Nolopo Nosop river-systems; it was part of this ridge which we noticed north of Lehutitu.

"Travelling from Lehutitu to Okwa one passes for three or four days by ox-wagon over a strip of country which rises some 400 feet above that south of Lehutitu, and a thousand feet above Lake Ngami; this elevation would not be detected unless altitudes were taken daily, as the rise is very gradual and undulating, but the condition of the grass on this higher country was most noticeable. Here there had evidently been more rain, and that more recently than below, for there were quantities of young green grass twelve inches high in June, while the surrounding country was scorched and yellow, showing that more moisture and local rains had been attracted by this rising ground. Also, as soon as the descent from this elevation to the Lake was begun there was a marked change in the vegetation, and many semi-tropical trees, plentiful in the lake district, began to appear, marking, I believe, the Ngamiland side of this low watershed. Again, on the east side of the desert there is a similar phenomenon, but more sharply accentuated, the fall from Palapye level to the nearest point of the Botletle river being rather more than 2000 feet. This was noticed by Livingstone in 1849 (see Livingstone's 'Missionary Travels in South Africa,' chapter 3, p. 66).

* Three of the new species, belonging to the family Siluridæ, have been described and figured in the recently published volume of the 'British Museum Catalogue of African Fresh-water Fishes' (1911), and the figures are reproduced here by permission of the Trustees

"Now, as I have said, the lowest point of the whole Kalahari basin north of the Orange river is the Great Makarikari Salt Pan, and unless there was some rising ground between it and the Molopo and Nosop rivers, those rivers would probably have drained into it instead of into the Orange river as they do *.

"At the present day the importance and capacity of Lake Ngami is infinitesimal when compared with the huge extent of the Okovango marshes and periodically flooded area to the north and north-east, and it is important to realize that the origin and only source of all the streams and marshes in Ngamiland is the great Okovango river (the rainfall in Ngamiland being of comparatively little importance in this respect), which rises in the Mosamba Mountains in Portuguese West Africa, and drains an enormous area with a very heavy rainfall from September to February. The result of this is a huge periodical flood which flows down the Okovango into the marshes of Ngamiland, of which Lake Ngami is really a part. These gradually rise and overspread hundreds of square miles of the surrounding country, which is extraordinarily flat, the inundation reaching its highest point not during the rainy season, but towards the end of the dry season, about August or September. None of this water finds its way out to the sea, but after filling the marshes north of the lake, and formerly the lake itself, flows on down the Botletle until lost by evaporation and percolation. No doubt on many occasions in the past some of this flood has reached the Great Makarikari Salt Pan, which is the lowest point of the whole Okovango river-system; but apparently no flood has been large enough to reach the Makarikari for many years, although an old dry river-bed can be traced a long way to the east of the present end of the Botletle.

"There is no doubt that it is only quite recently that the water-supply of Lake Ngami has failed, and the lake partially dried up, for although the processes which brought about this result must have been in progress long before Livingstone's visit in 1849, his description of the lake and his picture clearly show it to have been then an imposing sheet of water, and to a great extent open. To-day Lake Ngami is just a great reed-bed, which dries up almost entirely by the beginning of the periodical flood. Whether there are any large pools and open sheets of water in the interior of this reed-bed which do not dry up I cannot, unfortunately, say, as no white man has ever been far into the lake †, and native evidence is not unanimous on the subject; but I am certainly inclined to agree with those who say that by about March the Lake is absolutely dry on the surface, except for a few shallow pools at the south-east corner,

* "The watershed between the Zambesi and the Okovango river-systems is a low and very ill-defined one, and it is a doubtful question whether during the times of highest flood the Okovango marshes are not connected with the Chobe marshes."

† "It was very unfortunate that this point could not be cleared up, but owing to the sudden serious illness of my companion, a hasty retreat had to be made to the railway-line before the exploration of the centre of the Lake had been carried out."

where it is connected with the Botletle. The explanation of this change in the water-supply of the lake is to be found in the fact that previously one of the many large channels of the Okovango, called the Téoughé, ran into the lake at the north-west corner, but by a natural process of reed-growth and silting-up this channel has gradually become choked, till now no water at all finds its way into the lake from the north-west, and its only source of supply is at the south-east corner, where it is connected with the Botletle by a kind of backwater or arm, and through this it receives a certain amount of water when the floods have risen sufficiently high in the Botletle *. Into this backwater from the Botletle another channel from the Tamalakan (merely another name for the upper part of the Botletle) also runs, which brings a good deal of water towards the end of the flood season, but the lake never fills now to anything like its former level.

"As far as the value of the fish collection goes, I feel quite confident that there are not and never have been any fish in Lake Ngami which are not also in the Okovango and marshes, and although it would have been of interest geographically to penetrate to the centre of the lake, it would not have produced many new fish. But that there are fish in the upper waters of the Okovango which are not found in the marshes is highly probable."

Mormyridæ.

1. Marcusenius castelnaui, sp. n. (Plate XXXVIII. fig. 1.)

Depth of body 3 times in total length, length of head $3\frac{2}{3}$ times. Head as long as deep, twice as long as broad; snout rounded, $\frac{1}{5}$ length of head, projecting very slightly beyond mouth; mouth small, well below level of lower border of eye; teeth small, notched, 7 in upper jaw, 8 in lower; eye rather indistinctly defined, nearly as long as snout, its diameter not $\frac{1}{2}$ interocular width; posterior nostril a little lower down than upper, close to eye. Dorsal fin 17, originating above fourth ray of anal, its length half its distance from head, upper border slightly convex in front, longest ray $\frac{3}{5}$ length of head. Anal 23, similar to dorsal but longer, equally distant from base of ventrals and from base of caudal. Pectoral pointed, a little shorter than head, twice as long as ventral, extending to middle of latter. Caudal fin with rather short, rounded lobes. Caudal peduncle $2\frac{1}{2}$ times as long as deep, a little shorter than head. 48–50 scales in lateral line, $\frac{10-11}{14-15}$ in transverse series on body, $\frac{8}{7}$ in transverse series between dorsal and anal, 12 round caudal peduncle. Pale brownish, darker on the back, spotted and marbled with dark brown; fins brown.

Total length 70 mm.

* "Livingstone says that 'this channel has never been observed to flow either way, and is as stagnant as the lake itself.' This is certainly not so at the present day, for at the time of our visit it was running into the lake in a strong deep stream."

This small Mormyr, of which two specimens are in the collection, is most nearly related to *M. lhuysii* Stdr., from the Senegal, which differs principally in the higher number of dorsal and anal fin-rays.

2. Gnathonemus macrolepidotus Peters.

Numerous specimens, with 21 to 26 rays in the dorsal fin and 27 to 30 in the anal.

A third Mormyr, evidently of the genus *Mormyrus*, has been reported by Castelnau from Lake Ngami, and diagnosed as follows (p. 61):—

Mormyrus lacerda.

"Longueur totale, 0 m. 36.—Hauteur du corps, 0 m. 09.—Epaisseur, 0 m. 45.

"Forme ordinaire du genre; les yeux placés aux deux tiers de la hauteur de la tête; dents de la mâchoire supérieure au nombre de quatre, réunies en devant en un petit faisceau; elles sont assez longues, avancées et bifides à l'extrémité. Celles de la mâchoire inférieure forment une rangée autour de la bouche; elles sont fortes, carrées, en forme d'incisives et échancrées au milieu.

"D'un gris sale, avec le dessus de la tête noire, et le dessous de la gorge d'un jaune doré. L'anale est noire.

"Dorsale, 72.—Anale, 19.—Ventrales, 6.—Pectorales, 14.—Caudale manque."

Characinidæ.

3. Sarcodaces odoë Bl.

Hydrocyonoides cuvieri Castelnau, op. cit. p. 66.

A single specimen.

4. Alestes lateralis Blgr.

Numerous specimens.

A *Hydrocyon*, probably identical with the widely distributed *H. lineatus* Blkr., has been recorded by Castelnau under the name of *Hydrocinus vittatus* (p. 65).

Cyprinidæ.

5. Barbus trimaculatus Peters.

Four specimens.

6. Barbus paludinosus Peters.

A single specimen.

SILURIDÆ.

7. CLARIAS NGAMENSIS Casteln. (Plate XXXVIII. fig. 2.)

Castelnau's description (p. 63) is as follows:—

"Longueur, 0 m. 46.—Tête allongée, formant beaucoup plus du quart de la longueur totale; bouche portant quatre barbillons de chaque côté, le supérieur atteignant à peu près la longueur de la tête; celui du coin de la bouche est incomplet dans mon individu, mais semble avoir été assez long. Le suivant, à la mâchoire inférieure, est également incomplet, et l'autre est à peu près de la longueur du premier. La tête est couverte de fortes granulations, mais laisse au milieu deux espaces nus: l'un situé en avant et de forme allongée, l'autre placé en arrière et en ovale. L'œil est placé au tiers de la tête; la mâchoire supérieure avance considérablement sur l'inférieure. Les dents en velours forment une bande transverse; au vomer, l'on en voit une autre plaque grande, large, en forme de zone transversale, composée de petits tubercules très serrés, arrondis et disposés en pavé; à la mâchoire inférieure, elles sont semblables. Ligne latérale assez fortement marquée dans la moitié postérieure du corps; l'épine de la pectorale est grande, forte, large et à peine denticulée à son bord externe. La partie antérieure du corps est d'un noir grisâtre, le reste d'un rouge tirant sur le jaune; la caudale d'un noir foncé; l'anale d'un gris noir; la dorsale et les ventrales très noires. Le dessous du corps d'un jaune clair; nageoires avec chacune quatre bandes; sec, il paraît entièrement d'un brun obscur, avec le ventre et le dessous de la tête jaunes.

"On dit que ce poisson atteint de grandes dimensions.

"Dorsale, environ 66.—Caudale, 17.—Anale, environ 40.—Ventrales, 6.—Pectorales, 1/10."

This description might apply to the widely distributed *Clarias lazera*, and I had provisionally referred it to the synonymy of that species ('Fishes of the Nile,' 1907, p. 288). But Mr. Woosnam's collection contains an example of a *Clarias* which differs from all the species known to me, and at the same time agrees, except for the shorter nasal barbel, for the smooth head (ascribable to youth), and for the unimportant difference in the coloration, with Castlenau's description. I therefore feel justified in bestowing on this specimen the name of *C. ngamensis*, and append a description of it.

Depth of body $6\frac{1}{3}$ times in total length, length of head 3 times. Head $1\frac{3}{4}$ times as long as broad, smooth above (young); occipital process angular; frontal fontanelle $\frac{1}{3}$ length of head; occipital fontanelle small, in advance of occipital process; eye 3 times in length of snout, 5 times in interorbital width, which equals width of mouth and $\frac{2}{5}$ length of head; band of præmaxillary teeth 4 times as long as broad; vomerine teeth granular, forming a crescentic band which, in the middle, is nearly twice as broad as the præmaxillary band; anterior mandibular teeth pointed, posterior granular. Nasal barbel $\frac{1}{2}$ length of head, maxillary $\frac{3}{4}$, reaching middle of pectoral spine, outer mandibular $\frac{2}{3}$, inner mandibular $\frac{1}{2}$. Gill-rakers long, about 30 on anterior arch.

Clavicles striated, distinct under the thin skin. Dorsal 60, its distance from occipital process $\frac{1}{5}$ length of head, its distance from caudal fin $\frac{1}{4}$. Anal 50, narrowly separated from caudal. Pectoral not quite $\frac{1}{2}$ length of head, its spine serrated on the outer border and $\frac{2}{3}$ the length of the fin. Ventral equally distant from end of snout and from caudal. Caudal fin $\frac{1}{2}$ length of head. Olive, marbled with darker; belly white.

The single specimen measures 245 mm.

This fish comes very close to *Clarias mellandi* Blgr., described from a single specimen from L. Bangwelu, and might be referred to it but for the difference in the shape of the patch of vomerine teeth. As this is, however, a character which varies with age, I should have felt inclined to suggest uniting *Cl. mellandi* with *Cl. ngamensis* were it not that the type of the latter is larger (460 mm.) than that of the former (245 mm.), and yet, judging from Castelnau's description, the condition of the vomerine teeth, "en forme de zône transversale," agrees with that seen in the small specimen brought home by Mr. Woosnam.

8. Clarias theodoræ M. Weber.

The specimens in Mr. Woosnam's collection are in some respects intermediate between *Cl. theodoræ*, known from Natal, Zululand, and the Upper Zambesi, and *Cl. fouloni* Blgr. from L. Bangwelu. Ventral $1\frac{1}{2}$ to $1\frac{3}{4}$ times as distant from caudal as from end of snout. Nasal barbel $\frac{3}{5}$ to $\frac{3}{4}$ length of head, maxillary $\frac{2}{3}$ to once. Clavicles striated, covered with thin skin. Pectoral spine feebly serrated on outer side. Dorsal 80–84. Anal 70–72.

9. Schilbe mystus L.

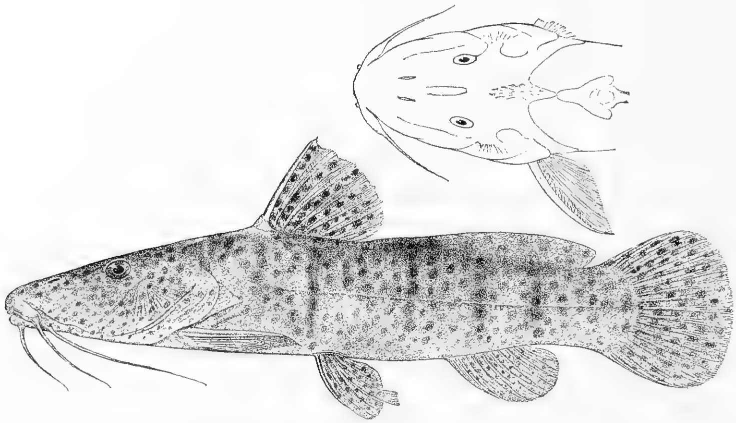
10. Auchenoglanis ngamensis.

Bouleng. Cat. Afr. F.W. Fishes, ii. p. 371, fig.

Depth of body $5\frac{1}{2}$ times in total length, length of head $3\frac{1}{2}$ times. Head moderately depressed, $1\frac{1}{2}$ times as long as broad, upper surface smooth; operculum with radiating striæ; occipital process small, longer than broad, in contact with the moderately large interneural plate; snout pointed, $\frac{1}{2}$ length of head; eye supero-lateral, 8 times in length of head, twice in interorbital width; mouth small, nearly terminal, with thick papillose lips; præmaxillary teeth in a small patch a little broader than long, with notched posterior border. Maxillary and inner mandibular barbels $\frac{1}{2}$ length of head; outer mandibular slightly shorter than head, reaching base of pectoral fin. Gill-rakers rather long, 8 on lower part of anterior arch. Humeral process short, triangular, feebly striated. Dorsal I 7; spine moderately strong, smooth, $\frac{1}{2}$ length of head, as long as longest soft rays. Adipose dorsal 9 times as long as deep, originating immediately behind rayed dorsal and extending nearly to root of caudal. Anal 13

(8 rays branched). Pectoral not reaching ventral; spine strong, strongly serrated on inner side. Ventral not reaching anal. Caudal rounded. Olive-brown, with numerous small round black spots, some of which form vertical bars on the sides of the body; belly white.

Text-fig. 85.



Auchenoglanis ngamensis. $\frac{5}{5}$.
(From Cat. Afr. F.W. Fishes.)

Of this new species Mr. Woosnam obtained a single specimen, 220 mm. long.

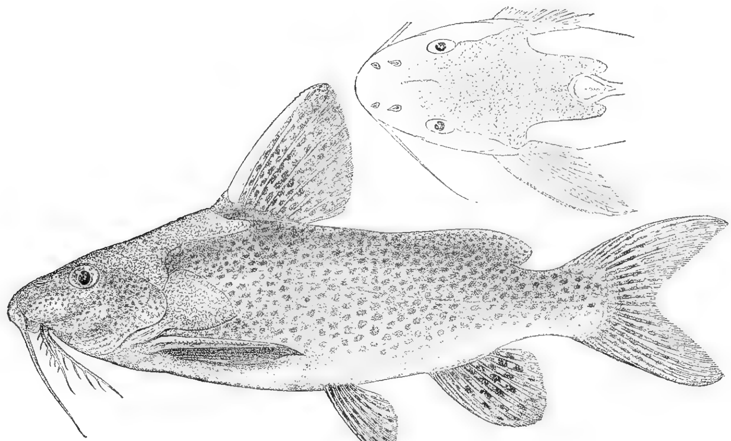
A. ngamensis, is closely allied to *A. ballayi* Sauv., from Cameroon, the Gaboon, and the Congo.

11. Synodontis woosnami.

Bouleng. Cat. Afr. F.W. Fishes, ii. p. 424, fig.

Depth of body $3\frac{1}{2}$ times in total length, length of head $3\frac{2}{3}$ times. Head a little longer than broad, rugose above from between the eyes; snout as long as postocular part of head; eye supero-lateral, 6 times in length of head, twice in interorbital width; lips moderately developed; præmaxillary teeth forming a short and broad band; movable mandibular teeth $\frac{1}{3}$ diameter of eye, 20 in number. Maxillary barbel not margined, $\frac{4}{5}$ length of head, reaching a little beyond root of pectoral spine; mandibular barbels with long slender branches, outer $1\frac{1}{2}$ times as long as inner. Gill-opening not extending downwards beyond base of pectoral spine. Occipito-nuchal shield rugose like the occiput, a little longer than broad, posterior processes obtusely pointed. Humeral process slightly longer than broad, obtusely pointed, not extending so far back as occipito-nuchal process. Dorsal I 7; spine $\frac{5}{6}$ length of head, slightly curved, smooth in front, feebly serrated behind. Adipose dorsal $3\frac{1}{2}$ times as long as deep, as long as its distance from rayed dorsal. Anal IV 8, rounded. Pectoral spine as long as dorsal, rather feebly serrated on outer border, strongly on inner. Ventral rounded, not reaching anal. Caudal deeply notched. Caudal

Text-fig. 86.



Synodontis woosnami. $\frac{3}{5}$.
(From Cat. Afr. F.W. Fishes.)

peduncle a little longer than deep. Dark brown above, lighter beneath; back, sides, and fins closely dotted with black.

Total length 150 mm.

A single specimen.

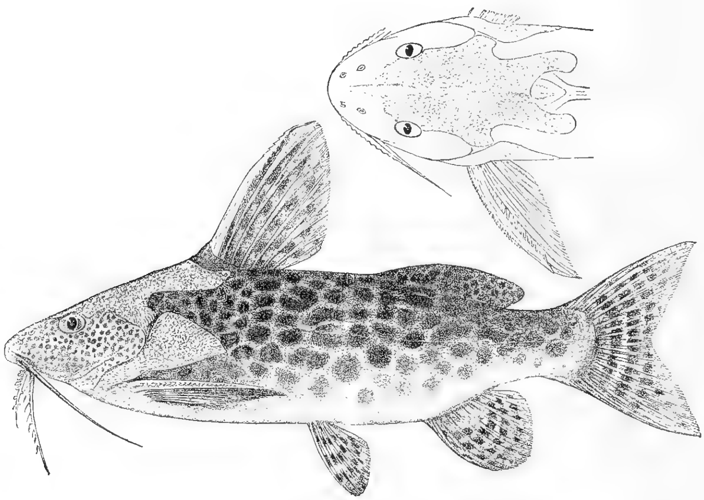
12. Synodontis macrostigma.

Bouleng. Cat. Afr. F.W. Fish. ii. p. 432, fig.

Depth of body $3\frac{1}{2}$ times in total length, length of head $3\frac{1}{3}$ to $3\frac{2}{5}$ times. Head a little longer than broad, rugose above; snout rounded and as long as postocular part of head; eye supero-lateral, 6 to $6\frac{1}{2}$ times in length of head, twice or a little over twice in interorbital width; lips moderately developed; præmaxillary teeth forming a short and broad band; movable mandibular teeth not quite $\frac{1}{2}$ diameter of eye, 20 to 26 in number. Maxillary barbel with a broad marginal membrane behind and a series of round warts in front, $\frac{4}{5}$ length of head, just reaching base of pectoral spine;

mandibular barbels with short tubercular branches, outer not quite twice as long as inner. Gill-opening not extending downwards beyond root of pectoral spine. Occipito-nuchal shield rough like the occiput, merely convex, as long as broad, posterior process rounded. Humeral process a little longer than broad, triangular, granulate, without keel, extending as far back as occipito-nuchal process. Dorsal I 7; spine as long as head, slightly curved, striated, smooth in front (except towards the end), serrated behind. Adipose dorsal 4 to $4\frac{1}{2}$ times as long as deep, $1\frac{1}{3}$ times as long

Text-fig. 87.



Synodontis macrostigma. $\frac{3}{4}$.
(From Cat. Afr. F.W. Fishes.)

as its distance from rayed dorsal. Anal IV 8, rounded. Pectoral spine shorter than dorsal, not reaching ventral, rather strongly serrated on outer border, very strongly on inner. Caudal deeply forked. Caudal peduncle as long as deep. Brown above, lighter beneath; back and sides with large round or oval blackish spots, fins with smaller spots.

Total length 160 mm.

A single specimen.

ANABANTIDÆ.

13. ANABAS MULTISPINIS Peters.

Dorsal XVII–XVIII 9; Anal VIII–IX 9; Lateral line 32–33.

This species was known from the Lower and Upper Zambesi and Lake Bangwelu.

CICHLIDÆ.

14. HEMICHROMIS FASCIATUS Peters.

Known from the Atlantic watershed of Africa from Senegambia to Angola, and from the Chad Basin.

15. PARATILAPIA FREDERICI Casteln. (Plate XXXIX. fig. 1.)

Chromys frederici Casteln. op. cit. p. 15.

"Longueur, 0 m. 23.—Corps assez élevé; pectorales non prolongées; écailles couvertes de fines granulations, excepté sur le bord qui est lisse, au nombre de 22 sur la portion supérieure de la ligne latérale, et de 14 sur l'inférieure. Dents très peu nombreuses, surtout à la mâchoire supérieure, toutes très écartées les unes des autres, coniques et pointues, placées sur une seule ligne, si ce n'est en avant, à la mâchoire inférieure. Corps d'un blanc gris; caudale rougeâtre; anale rouge; pectorales d'un blanc sale; ventrales d'un vert peu prononcé; dorsale grise, avec les pointes rougeâtres.

"Dorsale, 15/14.—Anale, 3/8.—Caudale, 16 grands rayons.—Pectorales, 13.—Ventrales, 5."

The following description is drawn up from three specimens, differing among themselves, as well as from Castelnau's definition, in the coloration, and for which, on account of the number of scales and fin-rays, as well as of the rather feeble dentition, I propose the name of *Paratilapia frederici*.

Depth of body $2\frac{1}{2}$ times in total length, length of head 3 times. Head twice, or a little over twice, as long as broad, upper profile slightly concave in front of eyes, jaws equal in front; snout rounded, as long as broad, as long as or slightly longer than postocular part of head; eye 5 to $5\frac{1}{3}$ times in length of head, $1\frac{1}{5}$ or $1\frac{1}{4}$ times in interorbital width, less than præorbital width; mouth not extending to below anterior border of eye; teeth in outer series rather small, 25 to 30 on each side of upper jaw, followed by one or two irregular series of minute teeth confined to the anterior part of the jaws; 3 or 4 series of scales on the cheek, the vertical diameter of the scaly part greater than diameter of eye. Gill-rakers short, knob-like or anvil-shaped, 11 or 12 on lower part of anterior arch. Dorsal XV 13–14; spines increasing in length to the last, which is about $\frac{2}{5}$ length of head; longest soft ray $\frac{3}{5}$ to $\frac{3}{4}$ length of head. Anal III 8–9; third spine longest, $\frac{1}{3}$ length of head. Pectoral $\frac{3}{4}$ to $\frac{4}{5}$ length of head, not reaching vertical of origin of anal. Ventral reaching vent. Caudal rounded. Caudal peduncle as long as deep. Scales rugose, not denticulated, 32–34 $\frac{3\frac{1}{2}}{10\frac{1}{2}}$; lat. l. $\frac{21\text{–}23}{14\text{–}15}$.

The three specimens in the collection differ, as I have said, in the coloration. One (native name: *Nchu*), sketched by Mr. Woosnam, is olive-green above, shading to pale oil-green below, with a vertical brown bar at the base of each scale; the dorsal and ventral are represented as dark sage-green, with round yellowish-brown spots, the edge of the former and the corners of the latter crimson-red; the pectoral lake-red, the anal pink, edged with reddish and with round pinkish-white spots; the ventral olive-green. The second differs in having a blackish lateral stripe, extending from the opercular spot to the root of the caudal fin. The third has also a lateral stripe, but it is traversed by eight blackish vertical bars descending from the dorsal; round white spots (in spirit) are very distinct on the anal. The largest specimen measures 210 mm.

16. PARATILAPIA SMITHII Casteln. (Plate XXXIX. fig. 2.)

The original description of *Chromys smithii* (p. 16) is as follows:—

"Longueur totale, 0 m. 23.—Corps assez élevé. Pectorales non-prolongées; écailles au nombre de 22 sur la portion supérieure de la ligne latérale, et de 14 sur l'inférieure; ces écailles sont lisses sur le bord externe, avec le disque couvert de granulations, fermant un peu des lignes concentriques. Dents petites, sur deux rangées. D'un noir brillant en dessus; au dessous de la tête, d'un rouge foncé; ventre jaune; la dorsale verdâtre avec les pointes grises; les ventrales et anale violettes; les pectorales d'un violet clair; la caudale verdâtre avec les pointes violettes."

This species is regarded as near *Chr. frederici*, and confounded with it by the natives under the name of *Tapic*. I have decided to refer to it three examples of an apparently distinct species, which I will describe under the above name.

Depth of body $2\frac{1}{3}$ to $2\frac{1}{2}$ times in total length, length of head 3 times. Head twice as long as broad, upper profile slightly concave in front of eyes; jaws equal in front; snout rounded, as long as broad, as long as postocular part of head; eye 4 to $4\frac{1}{2}$ times in length of head, $1\frac{1}{5}$ to $1\frac{1}{4}$ times in interorbital width, equal to præorbital width; mouth not extending to below anterior border of eye; teeth in outer series rather small, 26 to 32 on each side of upper jaw, followed by one or two series of minute teeth; 5 series of scales on the cheek, the vertical diameter of the scaly part a little greater than diameter of eye. Gill-rakers short, knob-like, 9 to 12 on lower part of anterior arch. Dorsal XIV–XV 12–13; spines increasing in length to the last, which is about $\frac{2}{5}$ length of head, longest soft ray $\frac{1}{2}$ to $\frac{2}{3}$ length of head. Anal III 8–9; third spine longest, about $\frac{1}{3}$ length of head. Pectoral $\frac{3}{4}$ to $\frac{4}{5}$ length of head, not reaching vertical of origin of anal. Ventral reaching vent or anal, or not so far. Caudal rounded-subtruncate. Caudal peduncle as long as deep or a little deeper than long. Scales feebly rugose, not or but indistinctly denticulated, 33–34 $\frac{3\frac{1}{2}}{10\text{–}11}$; lat. l. $\frac{21\text{–}33}{13\text{–}15}$.

Brown to blackish above (in spirit), yellowish or dark grey beneath; vertical fins olive-grey or dark brown, with round dark spots forming single series between the rays; pectorals greyish olive; ventrals greyish olive or blackish. "Iris brown over mauve, with a thin silver ring round pupil."

Total length 220 mm.

This species is barely distinguishable from the preceding by the larger eye and the smaller scales on the cheek, which form 5 instead of 3 or 4 series.

17. Paratilapia gibbiceps, sp. n. (Plate XLIII. fig. 1.)

Depth of body $2\frac{1}{4}$ times in total length, length of head $3\frac{1}{6}$ to $3\frac{1}{5}$ times. Head nearly twice as long as broad, upper profile very convex above the eye, jaws equal in front; snout rounded, a little broader than long, shorter than postocular part of head; eye $4\frac{1}{3}$ to $4\frac{1}{2}$ times in length of head, $1\frac{1}{4}$ times in interorbital width, equal to præorbital width; mouth extending to below anterior border of eye; teeth in outer series rather small, about 30 on each side of upper jaw, followed by two series of minute teeth; 4 series of scales on the cheek, the vertical diameter of the scaly part a little greater than diameter of eye. Gill-rakers short, posterior T-shaped, 10 or 11 on lower part of anterior arch. Dorsal XV 12–13; spines increasing in length to the last, which is $\frac{1}{2}$ length of head, longest soft ray nearly as long as head. Anal III 10; third spine longest, $\frac{2}{5}$ length of head. Pectoral as long as head, reaching vertical of origin of anal. Ventral reaching beyond origin of anal. Caudal rounded. Caudal peduncle a little deeper than long. Scales feebly rugose, not denticulated, 31–33 $\frac{3\frac{1}{2}}{11}$; lat. l. $\frac{21-23}{12-14}$.

Mr. Woosnam's coloured sketch of the fish (native name: *Nchu*) shows it to be olive above, pale green beneath; a purplish-brown bar at the base of the scales; pectoral pale olive, ventral dark olive; dorsal, anal, and caudal greyish; dorsal edged with red, the soft part with regular series of round purplish-brown spots; similar spots on the caudal; anal with round pink spots.

Total length 200 mm.

Two specimens.

18. Paratilapia longimanus, sp. n. (Plate XL.)

Depth of body $2\frac{2}{3}$ to $2\frac{3}{4}$ times in total length, length of head $2\frac{2}{3}$ to 3 times. Head 2 to $2\frac{1}{4}$ times as long as broad, upper profile straight or slightly concave; lower jaw slightly projecting beyond upper; snout obtusely pointed, as long as broad, shorter than postocular part of head; eye 4 to 5 times in length of head, equal to or slightly greater than interorbital or præorbital width; mouth extending to below anterior border of eye; teeth in outer series small, 26 to 30 on each side of upper jaw, followed by one or two series of smaller teeth; 5 or 6 series of scales on the cheek, the vertical diameter of the scaly part equal to or a little greater than diameter of eye. Gill-rakers short, posterior truncate or T-shaped, 9 to 11 on lower part of anterior arch.

Dorsal XV 13; spines increasing in length to the last, which is $\frac{2}{5}$ to $\frac{1}{2}$ length of head; longest soft ray $\frac{1}{2}$ to $\frac{3}{4}$ length of head. Anal III 9–10; third spine longest, $\frac{1}{3}$ to $\frac{1}{2}$ length of head. Pectoral as long as head, reaching vertical of origin of anal or beyond. Ventral reaching vent or anal. Caudal rounded. Caudal peduncle as long as deep. Scales rugose, not or but very indistinctly denticulated, 34–37 $\frac{4\text{–}4\frac{1}{2}}{11}$; lat. l. $\frac{23\text{–}25}{14\text{–}15}$.

Males dark brown to blackish, the scales on the body pale greyish brown in the centre; dorsal, anal, pectoral, and caudal with a broad light edge (grey in spirit), anal with round white spots. Female olive-brown above, yellowish beneath, with ill-defined darker cross-bands; vertical fins brown, with round darker spots. The smallest specimen is brownish above (in spirit), with five rather irregular dark cross-bands, the first across the nape; lower surface of head and belly whitish; dorsal, anal, and caudal brown with dark spots; a few white spots on the posterior part of the soft dorsal; pectoral blackish. Iris brown, with a gold or silver ring round the pupil.

Total length 155 to 240 mm.

Native name: *Nchu.*

Two specimens.

19. Paratilapia thumbergi Casteln. (Plate XLI.)

A large *Paratilapia* of elongate form, usually with 17 dorsal spines, referable to *P. robusta* Gthr., a species known from Lake Nyassa, the Zambesi, and Mossamedes, answers well enough to the description of *Chromys thumbergi* and *Chr. ngamensis* of Castelnau (p. 13) to leave no doubt in my mind as to the propriety of adopting the name *P. thumbergi* in preference to the later *P. robusta.*

I here transcribe Castelnau's descriptions:—

Chromys thumbergi.

"Longueur totale, 0 m. 30; corps un peu allongé; pectorales non prolongées; dents assez grandes, serrées, aiguës et un peu crochues, sur une rangée sur les côtés, et plusieurs en avant; épines de l'anale faibles. Dessus d'un brun noir, avec le dessous du corps châtain; caudale de la couleur générale; dorsale grise, couverte de taches arrondies, noires; anale grise avec les pointes rouges; toute sa surface est couverte de taches arrondies, vertes; pectorales verdâtres, ainsi que les ventrales; iris gris.

"Dorsale, 17/13.—Anale, 3/9.—Ventrales, 1/5.—Pectorales, 15.—Caudale, 16."

Chromys ngamensis.

"Poisson ovalaire allongé, ayant 0 m. 33 de long; nageoire dorsale à 31 rayons, dont les 17 premiers épineux; la caudale, 16; l'anale, 3/9; les ventrales, 1/5; les pectorales, 13. Les 14 derniers de la dorsale allant progressivement en s'allongeant.—Couleur générale d'un vert foncé, devenant d'un gris obscur en arrière; nageoire dorsale d'un gris sale, avec les rayons et l'extrémité de la partie membraneuse jaunes ; l'anale grise, parsemée de points rouges, et ayant l'extrémité jaune ; les ventrales d'un vert obscur ; les pectorales de même couleur, mais ayant leur extrémité jaune ; iris vert.—Il y a 26 écailles sur la portion supérieure de la ligne dorsale, et 17 dents fines et serrées, sur quatre rangées, à la partie antérieure de la mâchoire supérieure.

"Ce poisson est connu des naturels sous le nom de 'Lekeguana.'"

The following description is taken from the specimens, 125 to 275 mm. long, obtained by Mr. Woosnam :—

Depth of body $2\frac{4}{5}$ to $3\frac{1}{4}$ times in total length, length of head $2\frac{3}{5}$ to 3 times. Head 2 to $2\frac{1}{4}$ times as long as broad, upper profile slightly convex or slightly concave; præmaxillary process much shorter than the oral branch of the same bone, not extending to between the eyes ; lower jaw projecting ; snout obtusely pointed, as long as broad, shorter than postocular part of head; eye 5 to 6 times in length of head, equal to or a little less than interorbital or præorbital width; mouth extending to below anterior border of eye ; teeth moderate, in 3 or 4 series, 24 (young) to 40 on each side of upper jaw ; 7 or 8 series of scales on the cheek, the vertical diameter of the scaly part $1\frac{1}{2}$ to twice diameter of eye. Gill-rakers moderately long, rather slender, some of the posterior usually bifid or trifid, 11 or 12 on lower part of anterior arch. Dorsal XV–XVIII 13–16 ; spines increasing in length to the last, which is $\frac{1}{3}$ to $\frac{2}{5}$ length of head; longest soft ray $\frac{1}{2}$ to $\frac{3}{4}$ length of head. Anal III 10 ; third spine longest, $\frac{1}{3}$ length of head. Pectoral $\frac{3}{5}$ to $\frac{2}{3}$ length of head, not reaching vertical of origin of anal. Ventral not reaching beyond vent. Caudal rounded or subtruncate. Caudal peduncle a little longer than deep. Scales feebly rugose, not or but feebly denticulate, 39–41 $\frac{4\frac{1}{2}-5\frac{1}{2}}{12-13}$; lat. l. $\frac{23-25}{17-18}$.

A coloured sketch of one of the specimens (native name: *Nchu*) represents the fish as dark olive above, orange under the head, yellow on the anterior part of the belly, bluish on the posterior part, each scale with a reddish-brown spot at the base; dorsal and caudal dark olive, with round reddish-brown spots ; anal purplish grey, edged with yellow and with round red spots; pectoral and ventral dark olive; iris dark olive, with a yellow ring round the pupil.

Other specimens (in spirit) show the dark lateral band characteristic of the types of the species.

Total length 120 to 280 mm.

Chromys livingstonii Casteln. (p. 13) is regarded by that author as so similar to *Chr. ngamensis* as to constitute probably only a colour-variety. It may therefore be referred to the synonymy of *P. thumbergi*, with a query.

"La forme est semblable, mais le milieu du corps est d'un très beau jaune doré, sur un fond grisâtre; l'extrémité de chaque écaille est rouge; la dorsale, la caudale et l'anale sont grises, parsemées de points rouges, et bordées de jaune; les ventrales sont grises, avec la pointe rougeâtre; le dessus de la tête est d'un vert sombre; iris vert."

20. PARATILAPIA ANGUSTICEPS. (Plate XLII.)

Bouleng. Ann. & Mag. N. H. (7) xx. 1907, p. 108.

The following description is taken exclusively from the six specimens in Mr. Woosnam's collection (native names: *Mpwĕrĕ* and *Nchu*). The types are from Mossamedes and the Upper Zambesi, and the species also occurs in Lake Bangwelu.

Depth of body $2\frac{2}{3}$ to 3 times in total length, length of head $2\frac{3}{5}$ to $2\frac{4}{5}$ times. Head very strongly compressed, $2\frac{1}{2}$ to 3 times as long as broad, upper profile slightly concave; lower jaw projecting; præmaxillary process very long, extending to between the eyes; snout pointed, longer than broad, shorter than postocular part of head; eye 5 to $6\frac{1}{2}$ times in length of head, equal to or a little less than the interorbital or præorbital width; mouth extending to below anterior border of eye; teeth in 3 or 4 series, small, 30 to 40 on each side of upper jaw; 7 to 10 series of scales on the cheek, the vertical diameter of the scaly part $1\frac{1}{2}$ to $1\frac{3}{4}$ times diameter of eye. Gill-rakers rather short, those near the angle bifid or trifid, 11 or 12 on lower part of anterior arch. Dorsal XIV–XV 15–16; spines increasing in length to the last, which measures $\frac{1}{3}$ to $\frac{2}{5}$ length of head; longest soft ray $\frac{2}{7}$ to $\frac{3}{5}$ length of head. Anal III 12. Pectoral $\frac{1}{2}$ to $\frac{3}{5}$ length of head, not reaching vertical of origin of anal. Ventral reaching vent. Caudal rounded. Caudal peduncle as long as deep. Scales slightly rugose, not or but very finely denticulated, 36–39 $\frac{6\text{–}7}{13}$; lat. l. $\frac{20\text{–}24}{16\text{–}18}$.

The largest specimen (native name: *Mpwĕrĕ*), of which Mr. Woosnam made a sketch, is yellowish olive above, yellow beneath, each scale with a dark brown bar at the base; dorsal dark olive-grey, edged with yellow, with round brown or blackish spots between the rays; caudal dark olive-grey, with round black spots; anal pale olive, edged with yellow, with round bright spots edged with white; pectoral light olive, ventral dark olive; iris pale olive, with a yellow circle round the pupil. As now preserved this specimen has the head spotted with black.

Other specimens are brown above (in spirit) marbled with darker, and with a more or less distinct dark lateral stripe.

Total length 130 to 245 mm.

Had not the species to which these specimens belong been already properly described under the name of *P. angusticeps*, I should have been disposed to refer them, with a query, to *Chromys levaillantii* of Castelnau, which is defined as follows (p. 16):—

"Longueur, 0 m. 28.—Corps ovalaire, allongé; bouche protractile; pectorales assez courtes. Corps gris; toute la tête et la gorge couvertes de points rouges. Dorsale grise, garnie de points noirs; la caudale d'un vert sale, l'anale d'un vert jaunâtre, couverte de points rouge; ventrales et pectorales grises; iris d'un gris sale, avec un cercle jaune. Dents très petites, groupées en avant et sur une seule rangée latéralement. Epines de l'anale faibles.

"Dorsale, 15/14.—Caudale, 17.—Anale, 3/11.—Ventrales, 1/5.—Pectorales, 15."

21. Haplochromis moffati Casteln.

Chromys moffatii Casteln. op. cit. p. 16.
Chromys philander M. Weber, Zool. Jahrb., Syst. x. 1897, p. 148.
Haplochromis moffati Bouleng. Fish. Nile, p. 504.

This small and widely distributed fish was not described by Castelnau from Lake Ngami, but from the Kuruman river, a tributary of the Orange river.

22. Tilapia andersonii Casteln.

Chromys andersonii Casteln. Mém. Poiss. Afr. Austr. p. 14.
Chromys chapmanii Casteln. op. cit. p. 15.
? *Chromys sparmanni* Casteln. op. cit. p. 12 (non A. Smith).
Tilapia flavomarginata Bouleng. Ann. Mus. Congo, Zool. i. p. 123, pl. xlvi. (1899), and Poiss. Bass. Congo, p. 458 (1901).

I have little doubt that the fishes described as *Chr. andersonii* and *chapmanii* belong to the same species as I have named *Tilapia flavomarginata*, from the Mayombe, north of the Congo, which has since been rediscovered in Angola.

Castelnau's descriptions are here reproduced:—

Chromys andersonii.

"Longueur, 0 m. 36.—Le corps est plus élevé que dans les espèces précédentes; la pectorale est très longue; la partie molle de la dorsale est aussi prolongée; l'anale est grande.

"Dorsale, 16/15.—Caudale, 15—Anale, 3/12.—Ventrales, 5.—Pectorales, 14.—Dents posées sur quatre rangées, l'interne multiple. La couleur générale est un gris noir; la caudale d'un rouge foncé; l'anale, les pectorales, d'un blanc sale; la dorsale d'un beau gris, avec une bordure rouge. Iris noir. L'anale et la dorsale sont couvertes de taches arrondies et bleues. Les écailles sont granulées et légèrement rugueuses. La bouche est extensible. Les dents de la rangée externe sont terminées par deux tubercules."

The number of soft dorsal rays, 15, is probably a misprint for 13.

Chromys chapmanii.

"Longueur totale, 0 m. 22.—Corps court et assez élevé.—Les quatre premiers rayons des pectorales très prolongés; écailles grandes, couvertes de rugosités disposées en lignes concentriques. Les écailles sont au nombre de 22 sur la portion supérieure de la ligne latérale, et de 12 sur la portion inférieure. Les écailles de la partie postérieure du corps sont un peu sinueuses à leur bord postérieur, et quelques-unes échancrées au milieu. Les épines de l'anale sont très faibles. Ce poisson est d'un gris blanc ; la caudale est noirâtre, avec le milieu jaune ; l'anale est semblable, mais le jaune est moins éclatant ; la dorsale est grise, variée de jaune, et les pointes sont rougeâtres. Les ventrales, les pectorales et le ventre sont d'un blanc jaunâtre. Les dents fines, sur plusieurs rangées très irrégulières ; beaucoup d'entre elles sont terminées par deux ou trois tubercules. Dorsale, 16/11.—Anale, 3/10.—Caudale, 16.—Pectorales, 15.—Ventrales, 1/5."

C. sparmanni of Castlenau belongs probably to the same species, as far as can be guessed from the following definition :—

"Longueur, 0 m. 19 ; corps haut et assez court ; pectorales un peu prolongées à leur partie antérieure, et atteignant presque la base de la dorsale ; dents assez fortes, avancées, serrées, longues et terminées par deux tubercules ou pointes mousses, dont l'une est un peu plus longue que l'autre ; épines de l'anale faibles ; corps d'un vert obscur ; caudale ayant sa première moitié d'un rouge foncé et l'autre d'un blanc verdâtre ; l'anale, les pectorales rougeâtres ; la dorsale d'un gris noir ; ventrales d'un blanc sale. Dorsale, 16/12.—Caudale, 16.—Anale, 3/10.—Ventrales, 1/5.—Pectorales, 14."

Mr. Woosnam's specimens, nine in number, are here described.

Depth of body 2 to $2\frac{1}{2}$ times in total length, length of head 3 to $3\frac{5}{6}$ times. Head $1\frac{3}{4}$ to twice as long as broad ; snout rounded, with straight or convex upper profile, as broad as or a little broader than long, as long as or shorter than postocular part of head ; eye 4 to $5\frac{1}{2}$ times in length of head, $\frac{1}{2}$ interorbital width, equal to or a little less than præorbital depth ; mouth moderate, $\frac{3}{5}$ to $\frac{2}{3}$ width of head ; maxillary extending to between nostril and eye ; teeth very small, in 5 or 6 series, 70 to 110 in outer series of upper jaw ; 2 or 3 series of scales on the cheek, the width of the scaly part not greater than diameter of eye. Gill-rakers moderately long, 20 to 25 on lower part of anterior arch. Dorsal XV–XVII 12–13 ; spines increasing in length to the last, which measures $\frac{2}{5}$ to a little over $\frac{1}{2}$ length of head ; longest soft ray $\frac{2}{3}$ to $\frac{4}{5}$ length of head. Anal III 10–11 ; third spine longest, $\frac{1}{3}$ to $\frac{2}{5}$ length of head. Pectoral 1 to $1\frac{1}{4}$ times as long as head, reaching vertical of origin of anal, or beyond. Ventral reaching vent, or not quite so far. Caudal truncate or slightly emarginate. Caudal peduncle deeper than long. Scales finely granulate, not denticulated, 31–33 $\frac{3\frac{1}{2}}{15\text{–}16}$; lat. l. $\frac{18\text{–}23}{13\text{–}16}$.

Mr. Woosnam has made two coloured sketches of the fish obtained by him (native name : *Nchanu*). The first fish is dark brown, the scales edged with bluish white ; lower half of head and pectoral region bluish white, the former with large black spots and a dark blue opercular spot ; dorsal and anal brown, with large round white spots, the former edged with red, the latter with purple ; caudal purplish red, spotted with white ; pectoral pale buff, ventral dark blue ; iris dark brown, with a yellowish circle round the pupil. The second is dark brown above, shading to whitish beneath; dorsal and caudal dark olive, spotted with whitish, the former edged with purplish red; pectoral, ventral, and anal yellowish brown; iris as in the first specimen.

In spirit, the edge of the dorsal is yellowish (*flavomarginata*).

Total length 190 to 300 mm.

23. TILAPIA SPARRMANI A. Smith.

The three specimens in Mr. Woosnam's collection, of which a description follows, seem to show the species *T. fouloni* Blgr. to be untenable.

Depth of body 2 to $2\frac{1}{3}$ times in total length, length of head $3\frac{1}{6}$ to $3\frac{1}{3}$ times. Head $1\frac{2}{3}$ times as long as broad; snout rounded, with slightly convex or slightly concave upper profile, a little shorter than postocular part of head; eye 4 to $4\frac{1}{2}$ times in length of head, $\frac{3}{5}$ to $\frac{2}{3}$ interorbital width, equal to or a little more than præorbital depth; mouth moderate, about $\frac{3}{5}$ width of head; maxillary extending to between nostril and eye; teeth small, in 4 to 6 series, 60 to 80 in outer series of upper jaw; 2 or 3 series of scales on the cheek, the width of the scaly part less than diameter of eye. Gill-rakers short, 9 to 11 on lower part of anterior arch. Dorsal XIV–XV 10–11; spines increasing in length to the last, which measures about $\frac{3}{5}$ length of head; longest soft ray $\frac{3}{4}$ to once length of head. Anal III 10; third spine longest, $\frac{2}{5}$ to $\frac{1}{2}$ length of head. Pectoral a little shorter than head, not reaching vertical of origin of anal. Ventral reaching origin of anal or a little beyond. Caudal rounded. Caudal peduncle deeper than long. Scales granulate, not denticulated, 27–28 $\frac{3-3\frac{1}{2}}{10}$; lat. l. $\frac{17-18}{11-12}$.

Mr. Woosnam describes the colour as dark olive-brown, the scales with greenish-yellow margins; dorsal, caudal, and ventral fins olive-brown like the body, the former with darker and lighter stripes, pectorals paler; lower part of jaw and lower lip tinged with greenish blue with a dash of pink; opercular spot blue-black; iris brown, with a red-gold ring round the pupil.

Total length 145 to 190 mm.

24. TILAPIA MELANOPLEURA A. Dum.

Chromis latus Gthr.; *Tilapia rendalli* Blgr.

A widely distributed species in the Zambesi basin and in West Africa.

25. TILAPIA WOOSNAMI, sp. n. (Plate XLIII. fig. 2.)

Depth of body $2\frac{3}{4}$ times in total length, length of head 3 times. Head twice as long as broad; snout obtusely pointed, as long as postorbital part of head, as long as broad, with slightly convex upper profile; eye $4\frac{1}{4}$ times in length of head, equal to width of interorbital region or depth of præorbital; mouth moderate, $\frac{3}{5}$ width of head; maxillary extending to between nostril and eye; teeth in outer row rather large, 36 in upper jaw, with an inner row of very minute teeth; 6 series of scales on the cheek, the width of the scaly part equal to diameter of eye. Gill-rakers very short, knob-like, 12 on lower part of anterior arch. Dorsal XV 13; spines equal in length from the seventh, which is $\frac{2}{5}$ length of head; longest soft rays $\frac{1}{2}$ length of head. Anal III 9; third spine longest, nearly as long as longest dorsal. Pectoral $\frac{2}{3}$ length of head, not reaching vertical of origin of anal. Ventral barely reaching vent. Caudal rounded. Caudal peduncle as long as deep. Scales with feebly denticulated border, 34 $\frac{3\frac{1}{2}}{10}$; lat. l. $\frac{22}{16}$. Brownish above, yellowish beneath (in spirit); dorsal with round black spots between the soft rays.

A single specimen, measuring 110 mm.

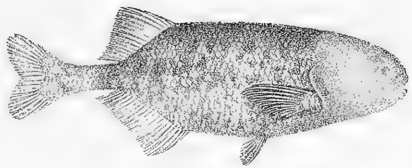
This species is allied to *T. jallæ* Blgr., from the Upper Zambesi, and to *T. humilis* Stdr., from Angola.

PLATE XXXVIII.

PLATE XXXVIII.

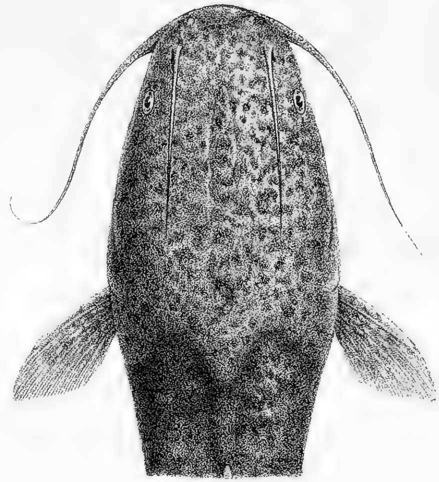
Fig. 1. *Marcusenius castelnaui* Blgr., p. 402.

2. *Clarias ngamensis* Casteln., p. 404, with upper view of head (*a*) and enlarged view ($\frac{3}{2}$) of dentition of upper jaw and palate (*b*).

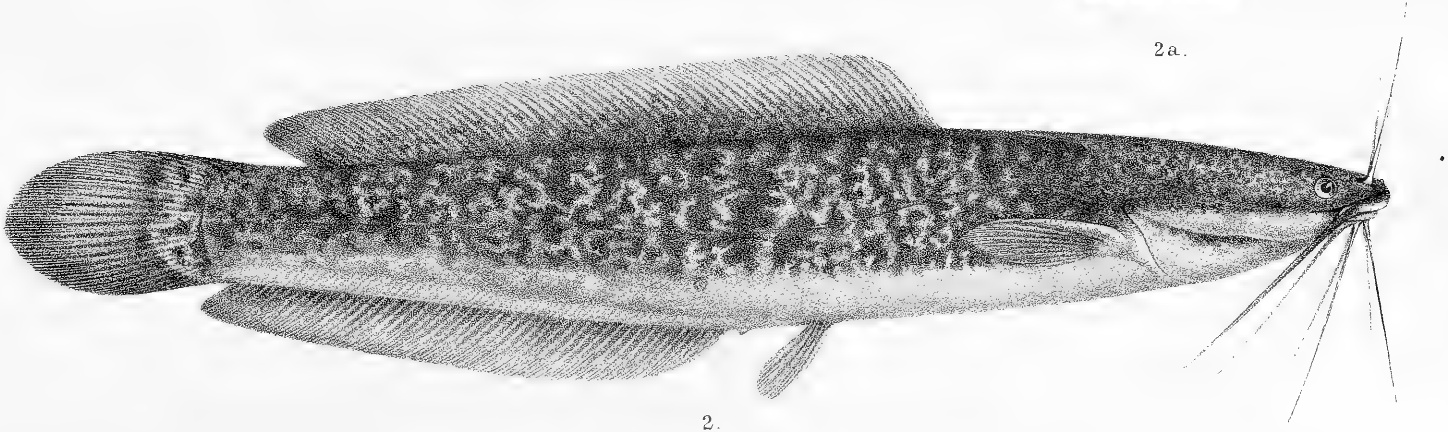


1.

2b



2a.



2.

J. Green del. lith. et imp.

1. MARCUSENIUS CASTELNAUI. 2. CLARIAS NGAMENSIS.

PLATE XXXIX.

PLATE XXXIX.

Fig. 1. *Paratilapia frederici* Casteln., p. 409, $\frac{7}{8}$, with upper view of head (*a*) and enlarged view ($\frac{3}{2}$) of dentition of upper jaw (*b*).

2. *Paratilapia smithii* Casteln., p. 410, $\frac{7}{8}$, with upper view of head (*a*) and enlarged view ($\frac{3}{2}$) of dentition of upper jaw (*b*).

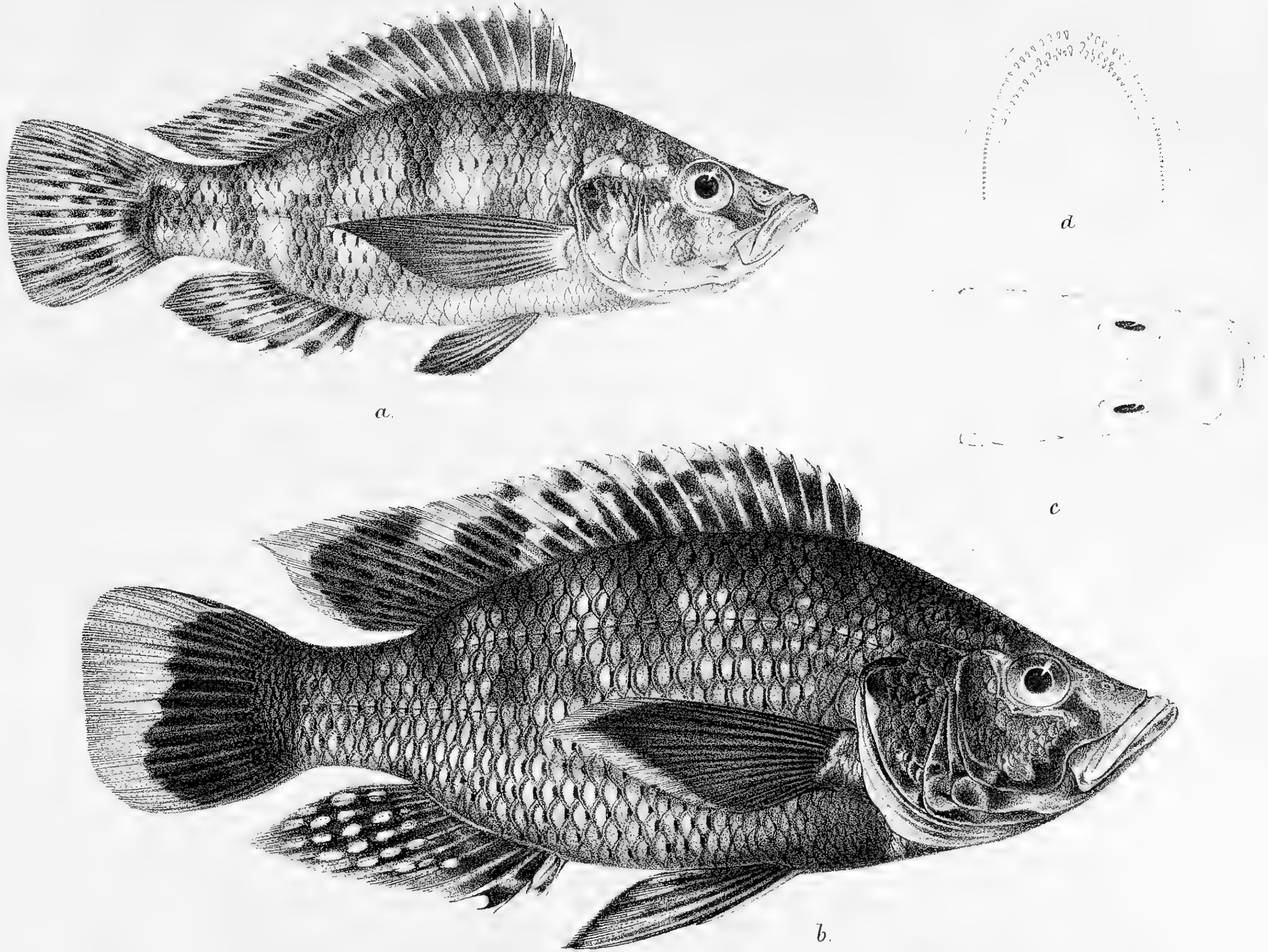
J. Green del. lith. et imp.

1. PARATILAPIA FREDERICI. 2. P. SMITHII.

PLATE XL.

PLATE XL.

Paratilapia longimanus Blgr., p. 411. Two specimens: upper (*a*) natural size, lower (*b*) reduced ($\frac{7}{8}$), with upper view of head (*c*) and enlarged view ($\frac{3}{2}$) of dentition of upper jaw (*d*).



J. Green del. lith. et imp.

PARATILAPIA LONGIMANUS.

PLATE XLI.

PLATE XLI.

Paratilapia thumbergi Casteln., p. 412. Two specimens (*a*, *b*), reduced ($\frac{3}{4}$), with upper view of head (*c*) and enlarged view ($\frac{3}{2}$) of dentition of upper jaw (*d*).

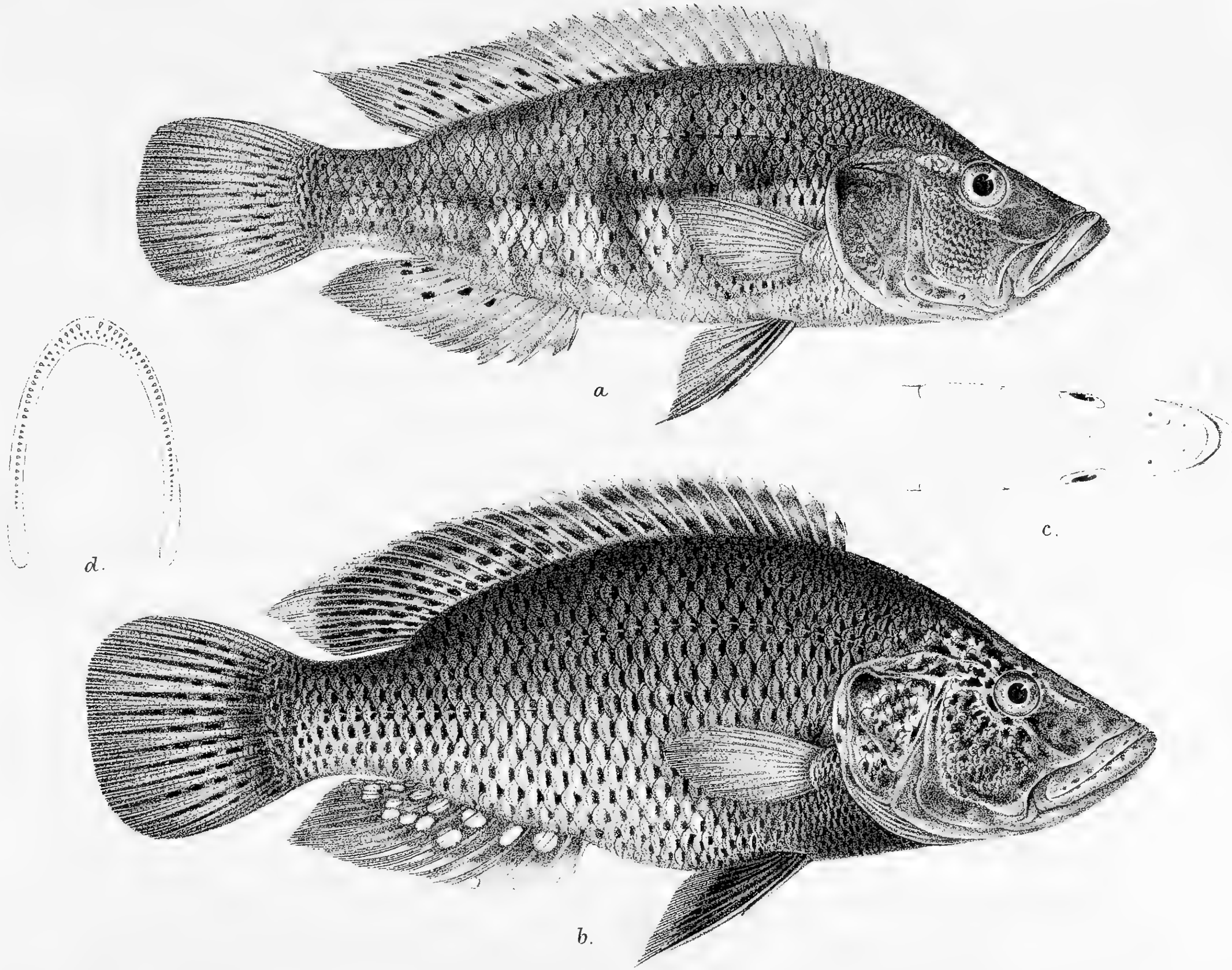
J. Green del lith et imp.

PARATILAPIA THUMBERGI.

PLATE XLII.

PLATE XLII.

Paratilapia angusticeps Blgr., p. 414. Two specimens (*a*, *b*), reduced ($\frac{5}{6}$), with upper view of head (*c*) and enlarged view of dentition of upper jaw (*d*).



J. Green del. lith. et imp.

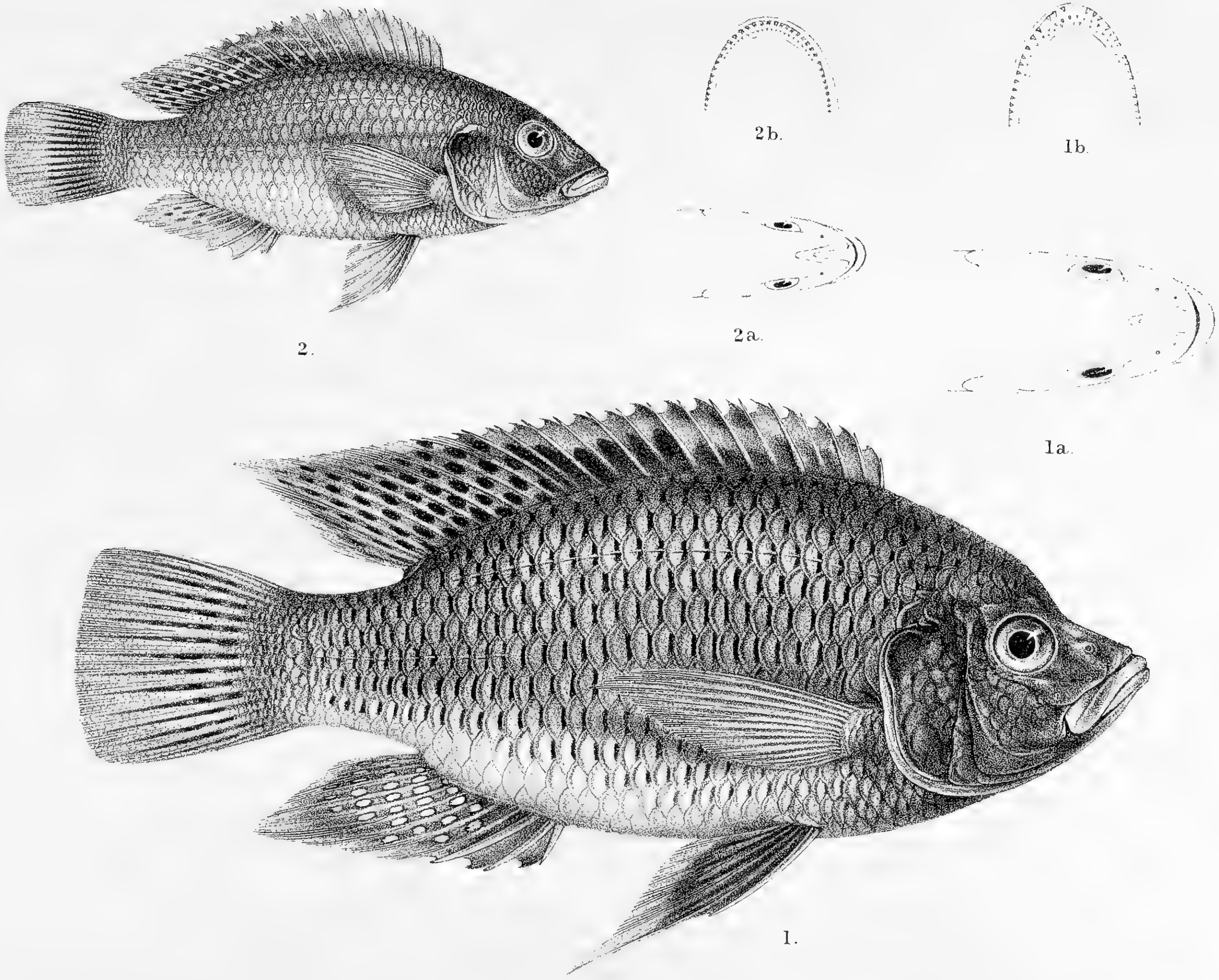
PARATILAPIA ANGUSTICEPS.

PLATE XLIII.

PLATE XLIII.

Fig. 1. *Paratilapia gibbiceps* Blgr., p. 411, with upper view of head (*a*) and enlarged view ($\frac{3}{2}$) of dentition of upper jaw (*b*).

2. *Tilapia woosnami* Blgr., p. 417, with upper view of head (*a*) and enlarged view ($\frac{5}{2}$) of dentition of upper jaw (*b*).



J. Green del. lith. et imp

1. PARATILAPIA GIBBICEPS. 2. TILAPIA WOOSNAMI.

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INDEX OF SPECIES, ETC., IN VOL. XVIII.

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May, 1911.

P. CHALMERS MITCHELL,
Secretary.

Boule